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Some buoyancy units float you in front. Some float you in back. But, only the all new Scubapro Stabilizing Jacket floats your entire upper body . . . front, back, under arms and around the neck . . . to hold you in the most restful attitude regardless of your diving position.

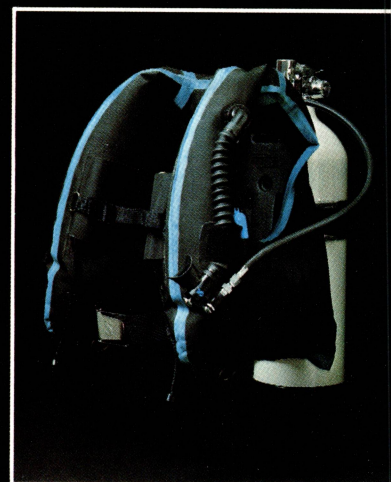
The Scubapro Stabilizing Jacket is a new dimension in underwater suspension. It not only moves you up and down, but its "balanced buoyancy" orients your body in a normal heads-up fashion to provide stability for maintaining or changing positions.

And on the surface, because the bulk of your air is below the shoulders, you ride high and dry.

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U.S. Patent 3,727,250
U.S. Patent 3,747,140
U.S. Patent 3,436,777



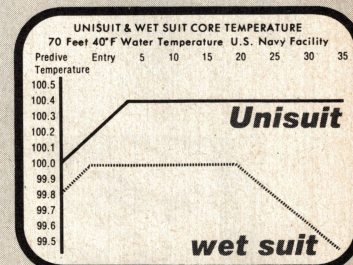
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There's no other suit quite like the Unisuit. This chart shows how U.S. Navy tests proved that the Unisuit protects divers better than any wet suit.

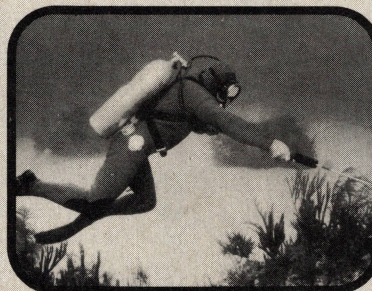


After 35 minutes Navy doctors were forced to stop the test to prevent tissue damage to the freezing wet suit diver. The Unisuit diver never even felt cold.

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skin diver

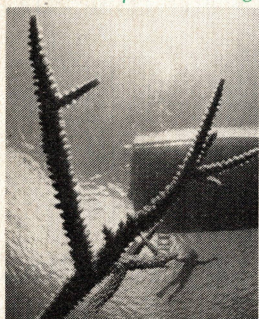
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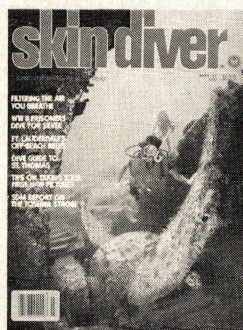
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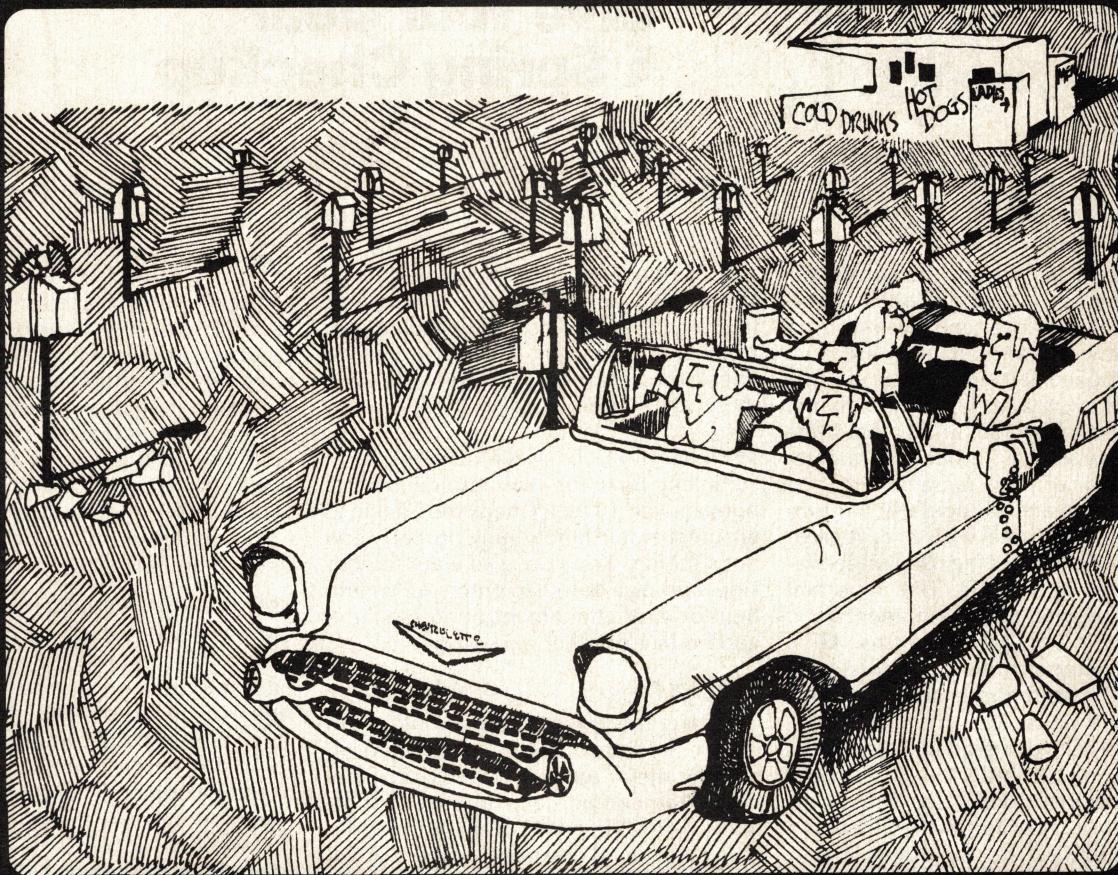
BONNIE J. CARDONE Assistant Editor / BEA HACKLER Ad Artist

cover

The photo was taken in 20 feet of water on the propeller of the wreck RMS Rhone, an hour and a half by boat from Saint Thomas in the British Virgin Islands. Paul J. Tzimoulis used a Seacor 21mm lens, Subsea 150 strobe and Ektachrome X film.

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offered twice in 1977: June 19 to July 23, and July 31 to September 3. Choose either of these programs and you will spend four weeks at F.I.T.'s Jensen Beach Campus, then move on to a week-long diving expedition to the best diving in the world: the Caribbean.

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KEEP THIS STUB



Editorial

Give Your Gear A Spring Checkup

by the Publisher

With spring just around the corner, it's time to think about dragging out that dive gear from your closet and dusting it off for the new season. Chances are, you have not looked at it since it was washed and stored away after last year's diving. There is also a good possibility that some of your dive gear is in need of maintenance, repair or parts replacement.

Dive equipment, particularly the rubber parts, deteriorate with age, regardless of whether it is being used underwater or stored in a closet. The important thing is to inspect your equipment *now*, before the dive season begins. Give yourself plenty of time to complete the necessary maintenance and shop for replacement parts.

In going over your gear, make a careful inspection of the little things — those insignificant items which are often overlooked or just taken for granted. Here is a handy guide for checking out your gear piece-by-piece. By following this simple check list, you may discover a few potential equipment failures and thus avoid a good deal of aggravation on the dive boat or underwater:

✓**MASK**—Check the headstrap for signs of cracking or splitting, especially around the buckle area. If it looks suspicious replace the strap with a new one and buy another for an emergency spare. Treat both straps with Armor All.

✓**SNORKEL**—Check the tab for cracking or tears. Replace if necessary and obtain another tab as a spare. Make sure the mouthpiece section is solidly glued to the snorkel tube. Also check the mouthpiece bit for tears or cracking.

✓**FINS**—Check the heel straps for cracking or crazing, especially in the buckle area. Replace straps if they look suspicious. Treat all heel straps with Armor All protective coating. Also check the fin blades for signs of splitting.

✓**WET SUIT**—First check all zippers to make sure they are moving freely, and lubricate thoroughly with Zipper-Ease or silicone spray. Next, check the seams for signs of splitting, especially in the armpit and crotch area. Chances are your old

can of neoprene cement has hardened like a rock, and you'll have to purchase a fresh can of cement for making necessary repairs. If your suit has sewn seams, check for unraveling threads, and have these seams resewn or reglued.

✓**WEIGHT BELT**—Make sure you have sufficient lead for maintaining neutral buoyancy at 10 feet. Check the buckle to ensure that it is functioning properly and not slipping. You may also want to consider adding a belt snap onto your weight belt for easy attachment of a dive light, goodie bag or other accessories.

✓**BUOYANCY COMPENSATOR**—Inspect the low pressure air inflator to ensure smooth operation. Lubricate all moving metal parts with silicone. Fully inflate the compensator to check for air leaks. Flush the inside of the air bladder with a chemical cleaner to remove or kill any bacteria. If the compensator is equipped with a CO₂ inflator, check and lubricate the inflator mechanism and inspect the cartridge. Also make sure you have a spare cartridge.

✓**DIVE KNIFE**—Check the blade for rust spots, and remove with WD-40 spray. Lubricate the blade with a heavy coating of protective silicone grease. Check the retainer ring on the knife scabbard for splitting or cracking. Also check the scabbard straps for cracking or splitting. Replace whatever parts necessary.

✓**REGULATOR**—Attach it to a tank full of air to make sure it is working properly. If you suspect the regulator is breathing hard, have it cleaned and tuned by your local dive shop. Also inspect the sintered filter for signs of corrosion or rust, and take it in for repair if you see any suspicious discoloration. Make sure the exhaust valve is not stuck shut by exhaling into the mouthpiece.

✓**OCTOPUS UNIT**—Your octopus second stage should breathe as easily and as smoothly as your primary unit. If not, have it cleaned. Also check the attachment strap or clip for the octopus to make sure it is not frozen with corrosion.

✓**SUBMERSIBLE PRESSURE GAUGE**—Check the dial face for signs of water leakage or interior corrosion. Attach a regulator to the tank and turn on the air while watching the gauge. The needle indicator should move smoothly as the air pressure increases. Also, make sure your pressure gauge is reading accurately by comparing it with either another SPG or a hand pressure gauge. Check the hose fittings at both ends for signs of air leakage.

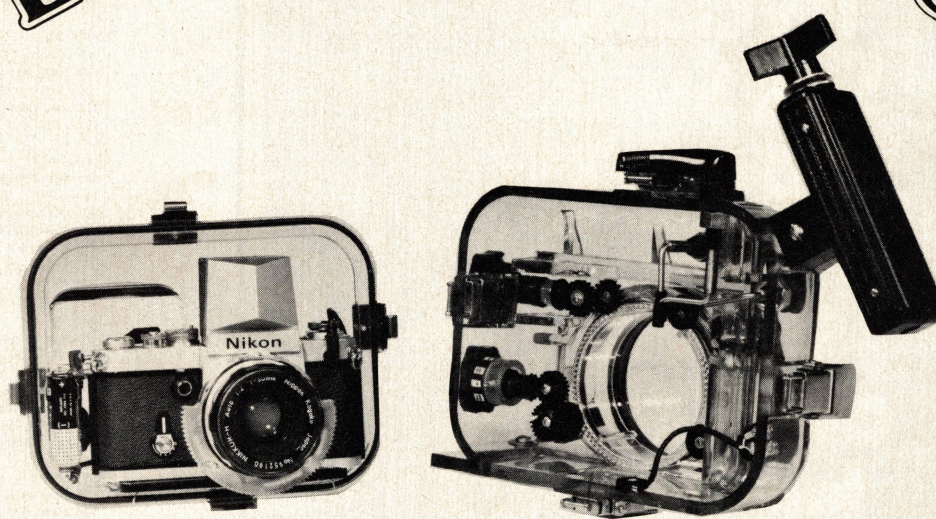
✓**TANK**—Have the interior of your tank visually inspected for rust or internal corrosion. This should be done regularly — once a year. Check your tank valve for signs of corrosion and make sure the valve turns on and off smoothly and easily. If it is hard to turn, no doubt it is in need of a thorough cleaning and lubrication by your dive shop repair man. Remove your tank boot and check for signs of external corrosion where the boot has trapped water. Remove the O-ring from the tank valve and replace with a new one if it looks at all worn.

✓**TANK PACK**—Check the pack for signs of cracking or corrosion, and inspect the tank band for signs of wear. Make sure the band is snugly bolted to the pack and the tank cannot wobble or slip when it is attached to the pack. Check all harness buckles for signs of wear or slippage. Be sure there are no parts missing from the harness assembly.

✓**DIVE LIGHT**—If it is the dry cell type, disassemble and replace the batteries with fresh ones. If it is a rechargeable, the battery should be recharged once every 30 days, even while in storage. Make sure you have a spare bulb for extended dive trips. Check your dive light laynard to ensure that it is in good shape and securely fastened to the light.

In addition to making a general equipment inspection prior to the diving season, you should go through the same procedure at least two days prior to every dive trip. You'll be amazed to find yourself experiencing far less dive gear failures throughout the season. And, you'll feel much more confident knowing your gear is in perfect working order. ➤

IKELITE'S GEARED UP FOR APERTURE SLR CASE



SLR CASE

FEATURES: The Ikelite SLR case has virtually been redesigned for 1977. This compact housing is a delight to carry and handles beautifully under water. The speed handle places the shutter release and film advance controls at your fingertips, and affords equally comfortable vertical and horizontal photographs. A unique gear drive provides precise focus control with all lenses, and the interchangeable port system offers unmatched versatility. A new gear drive aperture control allows positive and precise selection of the aperture you desire. Housings also include controls for film advance, shutter release, shutter speed, and meter switch where applicable.

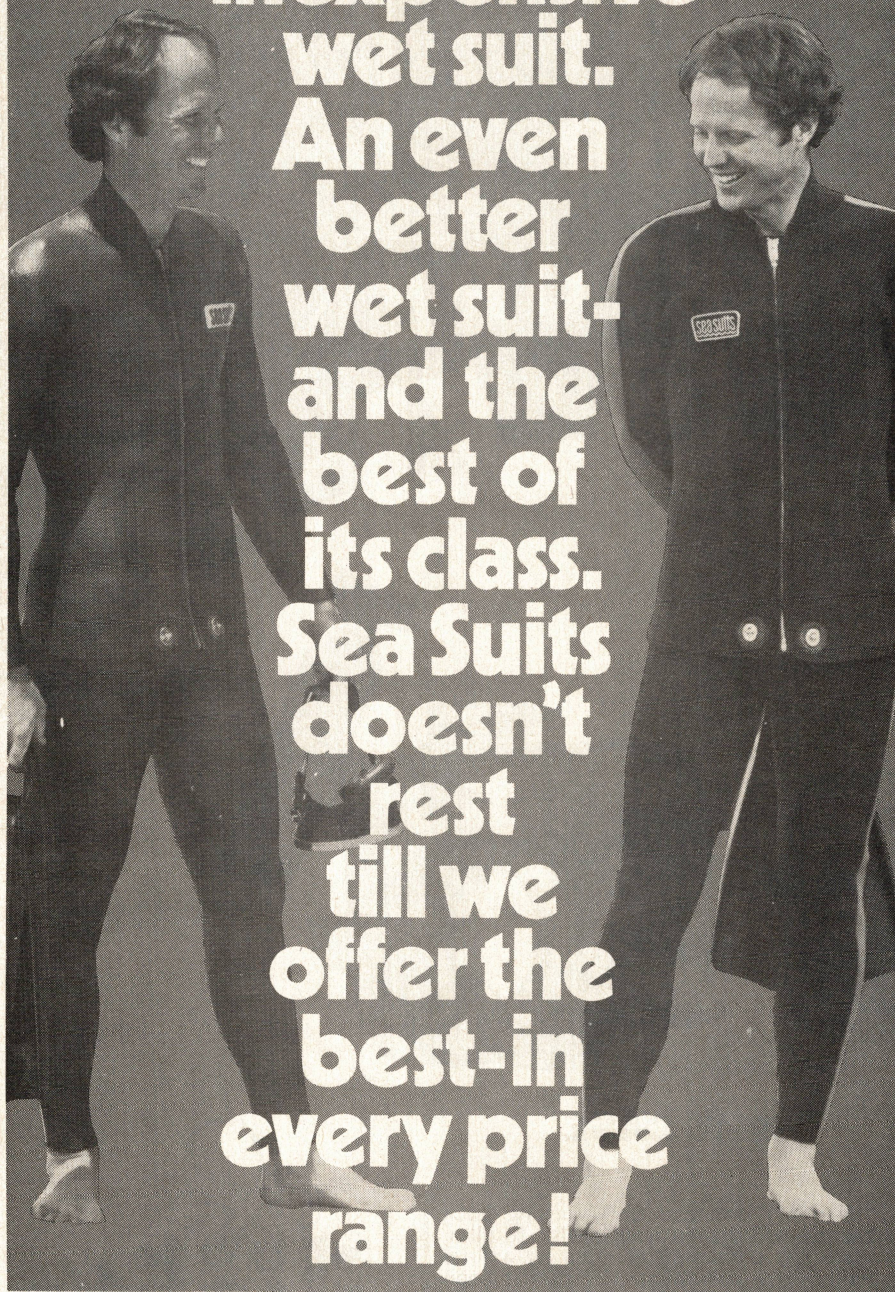
The newly designed SLR housing back has a new lid snap hook design to eliminate any possibility of cracking around the hooks. A new reinforcing rib has been added to the back for additional rigidity and strength. The bulkhead has been incorporated into the housing back with the battery pack so the camera can be secured to the back and connected for flash without being connected to the front part of the housing. All 1977 Ikelite SLR housings are wired to work with the new Ikelite SST flash system. The bulkhead provides for external flash connection, above or below water, for Ikelite electronic flash housings, #4022 and #4023 bulb flash, or #4032 and #4033 cube flash units.


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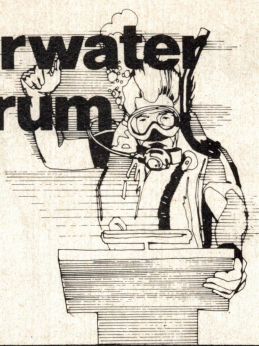
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Underwater Forum



Handicapped Diver

I am very interested in finding out how it is possible for people with leg amputations to scuba dive. I understand that a special long fin can be worn which compensates for the amputated leg. However, I do not know where to buy one or to have one specially made . . .

JAYNE SCHIFF
17 CRICKET LANE
GREAT NECK, N.Y. 11024

Can anyone out there help Ms. Schiff?

California Hazard

I have been diving off the California coast for over 20 years and have never seen a shark, underwater, more than four feet long . . . However, I recently encountered a situation that to me was momentarily as scary as *Jaws*.

. . . As my buddy and I slipped into the water, a dense, low fog bank was moving in. I could hear the distinct sound of a boat motor so I came up slowly, holding my speargun above my head. As I cleared the surface I saw a huge shape looming up in front of me. In the nearby boat, my buddies were waving the dive flag frantically and yelling at the top of their lungs. I started swimming desperately toward the boat. The skipper of the kelp harvester must have seen us by this time. I was able to get clear of the huge blades, and back in my boat.

We moved slowly up the coast to find another spot. Lo and behold, in a few minutes here comes the kelp harvester looming up through the fog. . . We gave way, leaving the area. This episode brought to mind a hazard that I hadn't even thought of before, and to which other divers should give consideration.

CHARLES COATES SAUGUS, CALIF.

Tuna Boycott

I agree with George Sharrand of New York and Ricky Goodner of Fort Worth, [Underwater Forum, December] concerning the killing of porpoises by tuna fishermen.

However, I do not agree that we should boycott ALL tuna products. I am a partner in a commercial fishing boat. We fish for Albacore tuna, not the yellowfin.

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<p>HELMET Miniature 1/8 scale model of world renowned U.S. Navy M.K. V diving helmet, ideal for desk, den, or mantel... \$44.95</p>	<p>SEAMCO 1/2" J valve: \$12.00 SEAMCO 1/2" K valve: \$8.00 Minimum Orders of 20 * we stock a complete inventory of parts for all current J. and K. type scuba valves... prices on request... * Special Quantity discounts</p>	<p>PURUS Gas powered compressor. Powered by a Briggs and Stratton engine, all ball bearings and needle bearing through out. Mounted on a lightweight channel frame, complete with filler hose and filters, for charging 3000 P.S.I. Scuba Tanks * Also available in elec. W/ 2H.P. 110 volt motor</p>
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Underwater Forum



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J. R. WITZKE SUNNYVALE, CALIF.

Diving Begins at 40

... Except for a handful of professional divers over 40, the scuba diver of today is relatively young... the diver over 40 is overlooked and unwanted.

... I would like to hear if there are other scuba divers in the Long Island area who would be interested in forming an over 40 scuba club. Not only would this club benefit the divers, but would provide for bringing the "scuba widows" together. It would spread interest in scuba as a sport to others in this age group. It could also benefit the members by arranging for dives, trips and vacations during the year. Write to me... if there is enough interest we could get together to form the "Over 40 Scuba Club."

Hoping to hear from the multitudes soon...

RUDY DUBIN
172 SALEM ROAD
WESTBURY, N.Y. 11590

Addendum to Diving Docs

This is to request that I be included in the list of Diving Physicians...

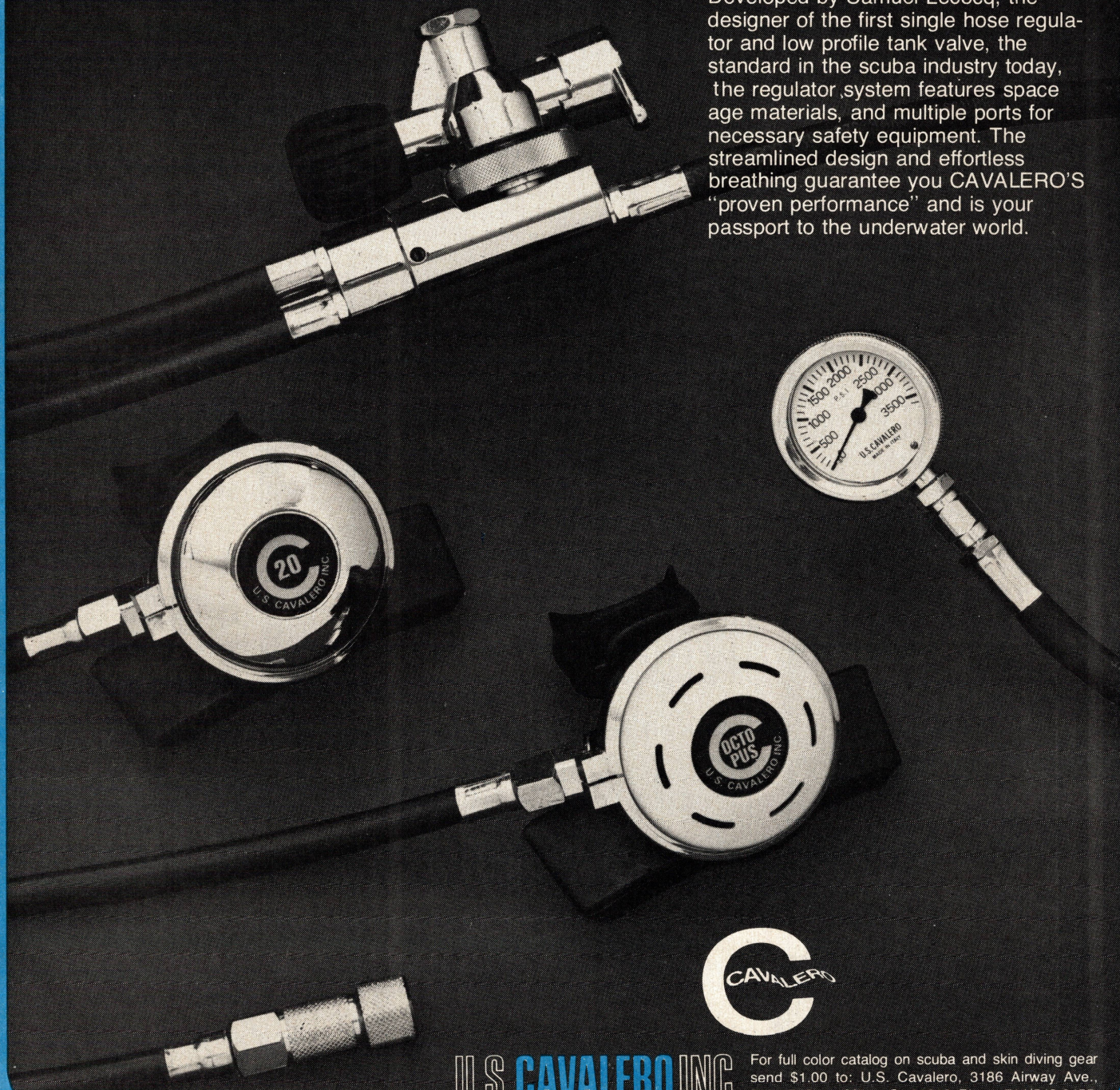
I am a certified scuba diver and completed the Physicians Underwater Medicine Program in January, 1976; the Diving Medical Examiner Course in November, 1976 and was elected a member of the International Society of Aquatic Medicine in May, 1976.

My primary specialty is orthopedic surgery, the secondary being diving and hyperbaric medicine...

S. VICTOR KING, M.D.
515 TWENTY-SIXTH STREET
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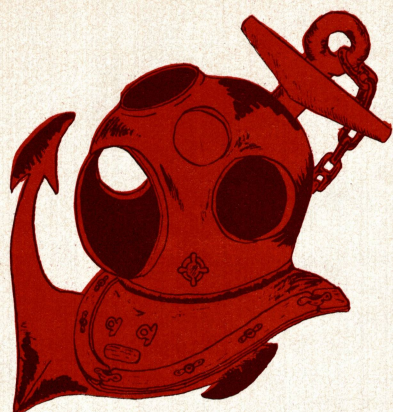
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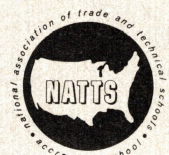
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Underwater Forum



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... Los Angeles County has established a system for the emergency treatment of diving victims. The U.S. Coast Guard and the emergency services of Los Angeles County Department of Health Services, Beaches (Lifeguard Division), Sheriff and Fire Services cooperate in the transportation and treatment of divers from any point in Southern California and beyond. A team of USC physicians is on 24 hour call for consultation in all types of diving problems and they are in attendance during all treatments at the USC Hyperbaric Chamber at the Isthmus on Catalina Island.

Access to this system may be made as follows:

Emergency Rescue and Treatment:
U.S. Coast Guard 213/590-2225,
or by VHF radio Channel 16
Less urgent physician consultation:
213/226-6619

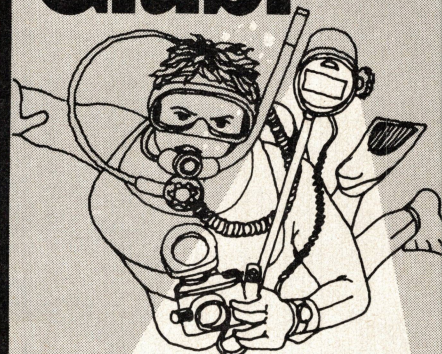
A. KENNETH BLAYDOW, M.D.
MEDICAL COORDINATOR,
USC HYPERBARIC CHAMBER TEAM
LOS ANGELES, CALIF.

Medically Related . . .

... a diver (at the outset, you should know it was me) is allergic to land grass pollens and this year was particularly bad for allergies. After three weeks the congestion subsides enough to allow him to dive again. So, he happened to go where prolific seaweed bloom was present. His mask flooded, so he cleared it. All was fine. But, for the next eight minutes or so the sneezes came underwater. After weathering that attack, he finished the dive uneventfully, but once out of the water, he went on sneezing for an hour or so. The water/air temperature difference was on the order of 25°F.

... Maybe a month to six weeks later, he went diving where a prolific bloom was present. Again sneezing started, but this time he descended from 25 to below

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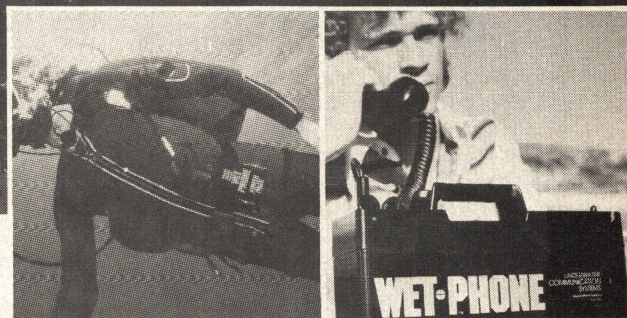
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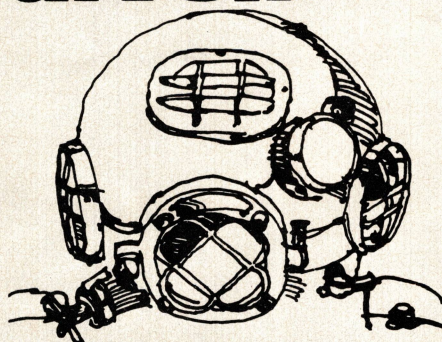
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Underwater Forum



a 35 foot thermocline where: a.) the temperature dropped from 70 to 56°F, and b.) the bloom stopped. Sneezing also stopped . . . (Air temperature was about 80°F.)

My question is this: Is it possible that someone who is susceptible to land grass allergy is susceptible to sea grasses in a similar way; and that the initial descent requires clearing the nasal passages, so could the process of clearing them eliminate a mucal barrier of the cellular membrane susceptible to the allergenic agent, hence, inducing an allergic reaction underwater?

The other possibility was a temperature reaction leading in some way to sneezing. I rule this out because in both cases of sneezing, the temperature differentials occurred in opposite directions. WILLIAM SAIDEL WOLLASTON, MA.

Scuba air is filtered so hasn't much pollen, and since a diver breathes by mouth, little of it reaches his nose anyway. Many with nasal allergy symptoms report relief when on scuba.

I've never heard of seaweed allergy that cause nasal symptoms. We don't have pollens, in the usual sense, underwater. However, if you've become allergic to planktonic material, water contacting your nose could presumably provoke a reaction.

The air from your scuba is always cold, because of the physics of expanding gases, and is not appreciably affected by water temperature. People with pollen allergies have hyperactive nasal membranes and sneeze more readily than others in response to any provocation, but the sensitivity of the sneezing reflex will vary greatly at different times. Switching from warm to cold air, or vice versa, could trigger sneezing. So could sudden changes in skin temperature. The paradoxical relief you got when moving from 70 degree to 56 degree water might be explained by increased sympathetic nervous activity and adrenalin release, caused by sudden cold.

The barrier effect of nasal mucus depends largely on its continuous formation and flow, carrying off the pollen, so clearing excess mucus before diving is not harmful.

CHARLES V. BROWN, M.D.

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YMCA Instructor Certification Institute,
Olympia, WA (Contact: Bill Allen, Rt. 8,
Box 344-B, Olympia, WA 98502)

March 5-6, April 2-3

NAUI Crossover Certification, Young-
stown, OH (Contact: Howard Rang, 1539
W. 8th St., Erie, PA 16505)

March 5-6

NAUI Crossover Certification, Buffalo, NY
(Contact: John Socha, 2910 Spangle St.,
RD 2, Canadagua, NY 14424)

March 6-16

PADI Instructor Training Course, Grande
Island, Philippines. (Contact: Roger Sea-
tle, PSC-4, Box 16949, APO San Fran-
cisco, CA 96274)

March 12-13, 19-20, 26-27, April 2-3

YMCA Scuba Instructor Institute, New
England Area. (Contact: Tony Salerno,
105 Beech St., Fitchburg, MA 01420)

March 14-20

PADI Instructor Training Course, Jack-
sonville, FL (Contact: Florida PADI Col-
lege, 4593 St. Johns Ave., Jacksonville,
FL 32210)

March 18-20

NAUI Crossover Certification, Miami, FL
(Contact: Ray & Shirley Van Hook, 16365
SW 280th St., Homestead, FL 33030)

March 19-26

NAUI Instructor Training Course, Santa
Barbara, CA (Contact: Homer Fletcher,
2273 Cove Ave., Los Angeles, CA 90039)

March 19-20, 26-27, April 2-3, 9-10

YMCA Scuba Instructor Institute, West-
ern New York area. (Contact: Ed Sexton,
1880 Salt Rd., Fairport, NY 14450)

March 19-26

PADI Instructor Training Course, Seattle,
WA (Contact: Peter Williams, 29637 11th
Pl. So., Federal Way, WA 98003)

March 20-28

PADI Instructor Training Course, Niagara
Falls, Ont., Canada. (Al Lambert, Canada
Scuba Schools, Box 157 Sta. H, Toronto,
Ont., Canada)

March 20-25

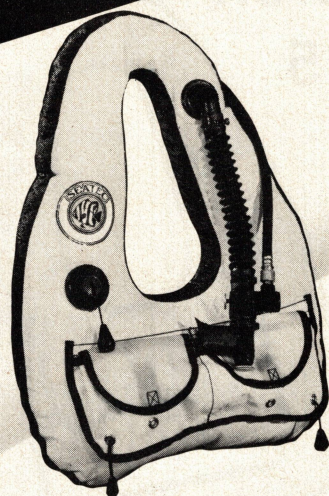
NASDS Clinic, San Diego, CA (Contact:
NASDS, P.O. Box 7666, Long Beach, CA
90807)

March 21-27

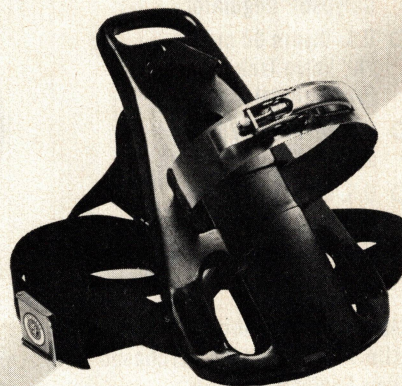
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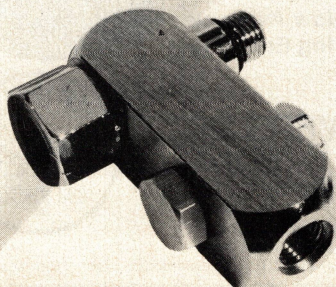


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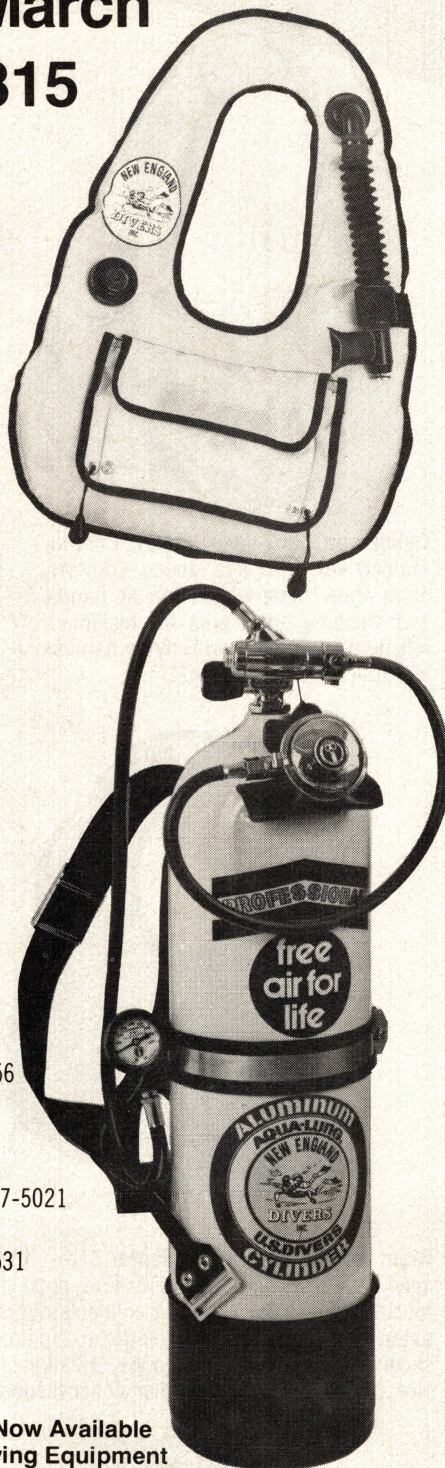
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Scuba Instructor Certification

March 21-April 1

Scuba Schools Int'l Instructor Clinic, Atlanta, GA (Contact: SSI Hdqrs, 1634 S. College Ave., Ft. Collins, CO 80521 [303-482-0883])

March 25-27, April 15-17, May 13-15

YMCA Scuba Instructor Institute, Southwestern Oklahoma State University, Weatherford, OK (Contact: Ken Rose, Health, Physical Ed, Recreation Dept., SW Okla. State Univ., Weatherford, OK 73096)

March 26-April 25

PADI Instructor Training Course, Bermuda (Contact: Bobby Robbins, Box 2403, FPO New York, NY 09560)

March 26-27, April 2-3, 16-17, 30, May 1

YMCA Scuba Instructor Institute, San Francisco Bay Area (Contact: Don Anderson, 402 Beatrice, Pleasant Hill, CA 94523)

April 4-June 10

PADI Instructor Training Course, Jacksonville, FL (Contact: Florida PADI College, 4593 St. Johns Ave., Jacksonville, FL 32210)

April 4

NASDS Instructor College, San Diego, CA (NASDS, P.O. Box 7666, Long Beach, CA 90807)

April 4

PDIC Instructor Training Course, Monterey, CA (Contact: PDIC, 598 Foam St., Monterey, CA 93940)

April 9-16

PADI Instructor Training Course, San Diego, CA (Contact: Jim Williams, 273 D St., Chula Vista, CA 92010)

April 15-17, 28-30-May 12-14

YMCA Scuba Instructor Institute, Boca Raton, FL (Contact: Doug Curtis, P.O. Box 642, Boca Raton, FL 33432)

April 16-17

YMCA Scuba Instructor Crossover Institute, San Pedro YMCA (Contact: John Roodenburg, 24530 Cadiz Dr., Lomita, CA 90717)

April 16-23

PADI Instructor Training Course, Truth or Consequences, NM (Contact: Philip Godbold, 1665 Lomaland Dr., El Paso, TX 79935)

April 23-24

NAUI Crossover Certification, New York City (Contact: Walt Hendrick, 348 E. 89th St., No 1E, New York, NY 10028)

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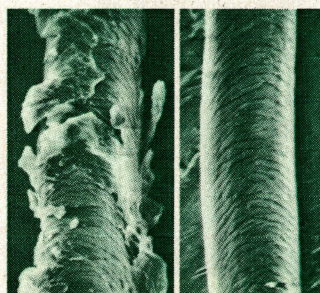
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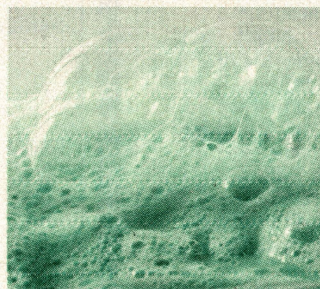
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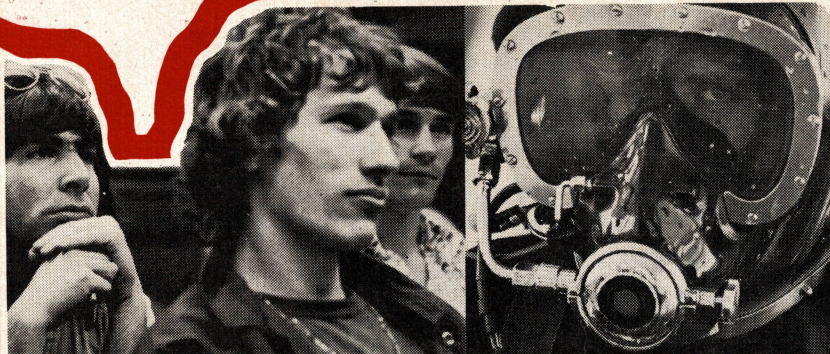
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April 29-May 15

PADI Instructor Training Course, Chicago, IL (Contact: Ralph Erickson, 6033 N. Sheridan Rd. #21G, Chicago, IL 60660)

April 30-May 7

YMCA Scuba Instructor Institute, Grand Cayman (Contact: Bob Abrams, 41 E. 42 St., New York, N.Y. 10017)

April 30-June 26 (6 weekends)

NAUI Instructor Training Course, Rockport, MA (Contact: John S. LeClair, 78 Circuit Rd., Medford, MA 02155)

April-May

PADI Instructor Training Course, Cedar Rapids, IA (Contact: Michael Ster, 1145 W. 8th Ave., Marion, IA 52302)

May 2-13

Scuba Schools Int'l Instructor Clinic, Denver, CO (Contact: SSI Hdqrs., 1634 S. College Ave., Ft. Collins, CO 80521 [303-482-0883])

May 21-29

PADI Instructor Training Course, San Marcos, TX (Contact: Don Dibble, 1426 Ranch Rd. #12, San Marcos, TX 78666)

May 20-22, June 17-19, 24-26

NAUI Instructor Training Course, Canandaigua, NY (Contact: John Socha % Community College of the Finger Lakes, Canandaigua, NY 14424)

May 20-22

NAUI Crossover Certification, Chicago, IL (Contact: Ken Frisco, 5401 S. 73 Court, Summit, IL 60501)

May 21-22

NAUI Crossover Certification, Connecticut (Contact: Ed Battistelli, 55 Larchmont Circle, Stratford, CT 06497)

May 21-27

YMCA Instructor Institute, Key West, FL (Contact: Tom Mount, P.O. Box 1547, Key West, FL 33040)

June-October

PADI Instructor Training Course, La Habra, CA (Contact: Steve Metcalf, 504' Fernleaf, Corona del Mar, CA 92625)

June 4-26 (weekends)

NAUI Instructor Training Course, Terre Haute, IN (Contact: Bill Shadburne, 806 Kinyon Ct., St. Louis, MO 63122)

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NAUI Instructor Training Course, Santa Monica, CA (Contact: Syd Albright, 848 Lincoln Blvd., Santa Monica, CA 90403)



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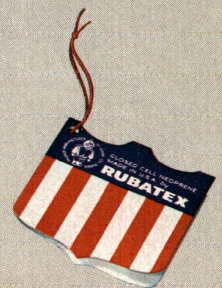
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SDM'S NATIONAL SCUBA EXAM

Category: Diving Fitness

A safe diver is a knowledgeable and skilled diver fit for diving. Fitness is every bit as important as the skill and knowledge. Test what you know about diving fitness by completing the following questions. One word is required for each blank. Choose your answer from the choices provided. Answers are on the following page.

1. Fitness is the ability to meet the demands of a _____.
2. To develop fitness, it is best to follow a program of gradually increasing the _____.
3. To increase fitness, work harder each workout by increasing the number of repetitions, decreasing the time for the same number of repetitions or increasing the _____.
4. Continuous maintenance of fitness allows a diver to meet the stresses of diving without _____.
5. The optimum transfer of fitness occurs when the fitness developing exercise closely resembles the _____.
6. Part of being fit for diving is knowing your _____ and not doing more than you are capable of doing.
7. After an extended period of inactivity, a _____ to redevelop fitness is recommended.
8. An experienced diver exerts less energy than a novice while diving due to _____.
9. To increase the level of fitness, divers must push their limits to _____, but not in open water.
10. To maintain fitness, it is recommended a person exercise for a particular activity _____.
11. The best method to remain in condition for diving is to _____.
12. Fitness can help _____ due to panic caused by excessive fatigue.
13. Fitness for an activity can be developed in six to eight weeks, but a _____ will occur with as little as one week of inactivity.
14. The ability to meet the physical demands of diving is affected by physical fitness, and also by _____.
15. The best conditioning exercise for diving is _____ swimming with mask, snorkel and fins.
16. Fitness is enhanced by skill efficiency achieved by _____.
17. Increased fitness for diving also results in _____.
18. The effects of _____ can quickly alter a person's level of fitness for diving.
19. The degree of fitness is a measure of the ability to _____ to areas of the body in order to meet energy demands.
20. The _____ of a regular and strenuous program for fitness include greater lung volume, increased blood volume, decreased heart rate and improved muscle tone.

Choose your answers from this list:
Each answer is used only once

- A. gradual program
- B. actual activity
- C. exertion level
- D. mental attitude
- E. supply oxygen
- F. physical limitations
- G. particular activity
- H. dive frequently
- I. skill proficiency
- J. excessive fatigue
- K. physical advantages
- L. increased self confidence
- M. strength and endurance
- N. regular and strenuous
- O. decrease in performance
- P. smoking and drinking
- Q. experience and knowledge
- R. resistance to movement
- S. several times weekly
- T. prevent dive accidents

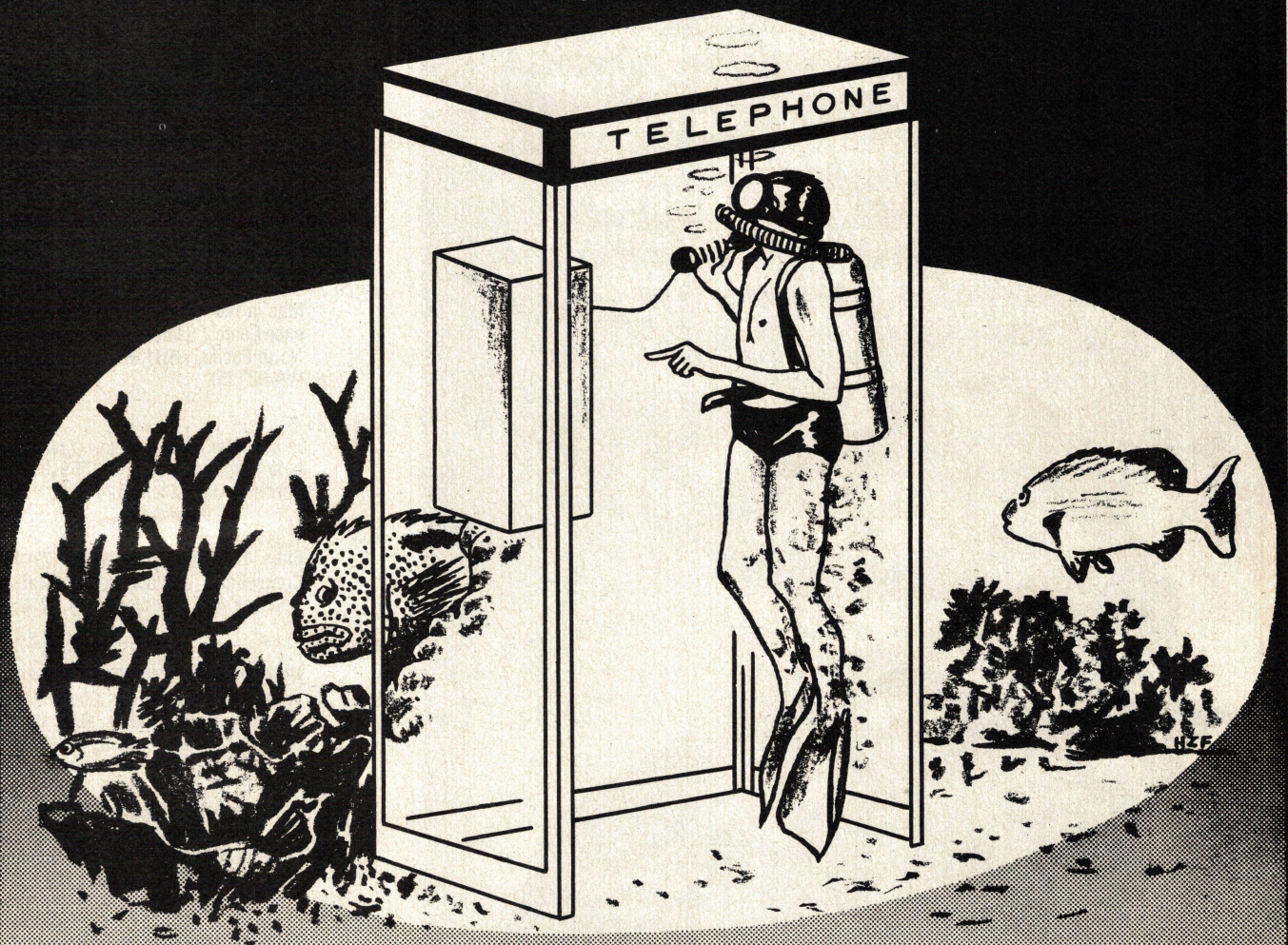
How well did you do? Turn the page to find out. Deduct five points for each incorrect answer. If you scored 80 or less, you need to learn more about fitness. Do you carry out a regular program to maintain diving fitness? Be fit and be safe. Next month's exam is on Diving Physiology.

SDM'S NATIONAL SCUBA EXAM

1. G. particular activity. Fitness implies cardio-vascular and muscular stamina, but this endurance must be developed for a purpose to be useful. Push-ups and golf, as examples, are not good exercises to develop fitness for diving.
2. C. exertion level. To increase fitness, the limits of endurance for an activity need to be pushed. A training program is recommended where each workout is a slight improvement over previous performance.
3. R. resistance to movement. Examples of ways to increase fitness for diving include swimming more laps with mask, snorkel and fins; swimming the same number in less time; or swimming the same number wearing additional weight. Improve fitness by working harder each week than you worked before.
4. J. excessive fatigue. By being fit for diving, the limits of strength and endurance are increased. This stamina increases safety for divers.
5. B. actual activity. The degree to which fitness from training is transferred to actual use depends largely on the similarity between the training exercise and the actual activity. As similarity decreases, so does transfer of fitness.
6. F. physical limitations. Know your limitations and dive within them. Don't be goaded into doing more than you are capable of doing. Be honest with yourself.
7. A. gradual program. Too often people try to match the performance they used to be capable of. If you haven't been diving for awhile or maintaining fitness for diving, make only ideal dives until fitness is redeveloped.
8. I. skill proficiency. A novice at any activity may exert several times as much energy as a pro, because the pro wastes little energy by making only necessary movements.
9. M. strength and endurance. During an open-water dive, a diver should be using fitness more than developing it. Pushing physical limits to increase fitness should be done in a safe training environment under observation.
10. S. several times weekly. Experts recommend training programs to develop and maintain fitness be repeated three to four times weekly. Weekend activities are only marginally effective for physical conditioning and need to be supplemented with regular training activity during the week.
11. H. dive frequently. Once conditioned for diving, regular diving will help maintain conditioning and proficiency. Fitness will probably not be increased from diving, but the training value is excellent.
12. T. prevent dive accidents. Diving is a physical activity and becomes even more so when things go wrong. Fitness can prevent excessive fatigue which could lead to panic in minor emergency situations.
13. O. decrease in performance. Fitness will be lost almost as quickly as developed. The only way to maintain a level of fitness is to continue the training activity. Once you reach the level of fitness desired, work out to that level several times weekly.
14. D. mental attitude. Anxiety and apprehension can seriously affect physical performance. If uncertain or apprehensive about a dive, don't make it, even if you are very fit for diving.
15. N. regular and strenuous. To develop diving fitness, push your limits in a controlled situation. This is best done by swimming hard several times weekly in a pool with mask, snorkel and fins.
16. Q. experience and knowledge. Efficiency is the ability to perform a task with minimal effort. Knowing how to do the task and practice will increase efficiency and decrease wasted energy which can be used to prolong performance.
17. L. increased self-confidence. Knowing you are physically capable of a task improves your mental attitude and reduces anxiety, making the activity more enjoyable.
18. P. smoking and drinking. Both of these habits rapidly reduce the oxygen supplying capability of the blood. Even the most fit individuals experience decreased performance after use of tobacco and alcohol.
19. E. supply oxygen. Fitness is really a measure of how well your body can use oxygen and how well your lungs, heart, blood and circulation can supply this oxygen.
20. K. physical advantages. Increased fitness develops all of the body's means to supply oxygen. This has the advantages of improved circulation, slower heart rate and a feeling of general well-being.

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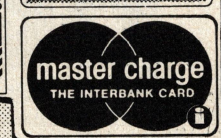
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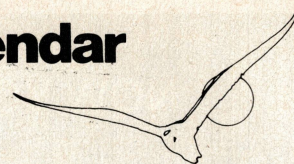
The Universal Instrument Console by Pennform was designed to house nearly all of the finest gauges available, from any manufacturer, in any combination. Whether you already have gauges or intend to buy, see your pro shop for details on what system is best suited for you. Available in black, blue, orange, yellow, and green. Pat. Pend.



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Calendar



March 5

Boston Sea Rovers '77, Boston, MA (Contact: Bunky Hodge, 174 Beech St., Rockland, MA 02370)

March 6-7

3rd Annual YMCA Scuba Convention, Copley Plaza Hotel, Boston, MA (Contact: Tony Salerno, Chrm., 105 Beech St., Fitchburg, MA 01420)

March 10

NAUI International Photo Competition entry deadline. (Contact: NAUI North Pacific, 6531 NE 198th St., Seattle, WA 98155)

March 20-21

Man in the Sea Symposium, Pacific Science Center, Seattle, WA. (Contact: NAUI North Pacific, 6531 NE 198th St., Seattle WA 98155)

March 25-27

Underwater 77, Toronto. (Contact: Ontario Underwater Council, 559 Jarvis St., Toronto, Ont., Canada)

April 2

Entry Deadline, Underwater 77 Photo Competition (Contact: Gene DeMarco, 34 Hancock Ave., Medford, MA 02155)

April 16

Underwater Symposium 77, Harvard University Science Center, Cambridge, MA (Contact: Fred Calhoun, P.O. Box 291, Back Bay Annex, Boston, MA 02117)

April 16

Underwater Film Review, John Hancock Hall, Boston, MA, 8 p.m. (Contact: Fred Calhoun, P.O. Box 291, Back Bay Annex, Boston, MA 02117)

July 3

1977 CEDAM International Convention & Expeditions, Akumal, Quintana Roo, Mexico. (Contact: Akumal Reservations Services, 5820 Burning Tree, El Paso, Texas 79912)

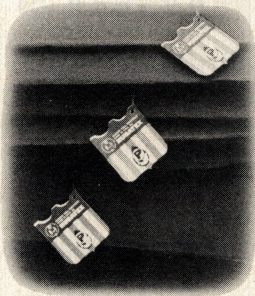


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North, I have learned to defy and defend;
Shoulder to shoulder we have fought it
out—yet the wild must win in the end."

*Robert Service

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Technifacts from a Master Diver

By E. R. Cross

The basic purpose of this column is to stimulate an interest in the technical aspects of diving and dive safety. It will be devoted to providing factual answers to questions from SKIN DIVER readers. Answers will be designed to apply to the majority of dive situations, problems, and equipment encountered in today's diving. Single subject questions are best suited to Technifacts and may be on any subject related to diving. Watch for your answers in Technifacts.

For their questions and comments used in this month's Technifacts I would like to thank Dennis Devine, Brooklyn, N.Y., Bruce Lanham, Pleasant Hills, California, and Valerie Cucera, Monroe.

FEMALE CHILDREN FOR DIVERS

A few years ago (late 1970 and early 1971) several articles appeared in newspapers and magazines about active divers having predominantly female children. During the next year and a half, this possibility was discussed in various publications, including SKIN DIVER. As a result of the correspondence generated by these articles, Technifacts attempted a survey of divers to determine if facts would substantiate rumor. About 80 respondents completed and returned the questionnaires. In addition to completed forms, several interesting letters were sent to Technifacts. One of these is quoted, in part, and stated, "as a physician, there are two aspects of your research design which concern me:

(a) This is a retrospective study. In view of the inadequate documentation maintained by individual divers, in the past, many of the questions asked are difficult, if not impossible, to answer. Although accu-

rate dive records have become most useful in recent years and virtually mandatory in some areas, we are both aware of very limited records that were maintained many years ago. Yet, I feel this is important since many of the children involved (in the survey) were conceived at a time when adequate records were not maintained, and,

(b) All of the questions in the research questionnaire relate to the time of conception. While I recognize that this is necessary, most parents are not aware of the time of conception, and many physicians do not accurately identify this for the patient unless specifically requested. In fact, the date of conception becomes increasingly more difficult to identify with a high degree of accuracy when one realizes that the majority of children are not born at exactly forty weeks gestation (nine months).

I feel that these observations are of sufficient significance to jeopardize the result of the study based on the design of the research questionnaire which I received and I would appreciate hearing from you in this context."

This is basically the same conclusion reached from a study of the 80 or so responses received from divers. Based on the total response to the questionnaire, there did appear to be a marked increase in female children born to divers over the national average. This showed up almost entirely in divers who were professional and were diving every day at jobs that were difficult, hazardous, and who were extremely stressed.

In this connection, researchers at Iowa State University have discovered evidence to support the idea that parental stress or anxiety can affect the sex of their offspring. The researchers believe that the male parent, when under stress, will produce predominately female-producing sperm. If not stressed, he will produce both male and female-producing sperm in about equal numbers.


I feel it would be almost impossible to design and use a questionnaire that can accurately develop the information desired. Your doctor can probably tell you of several ways to increase the odds of your having either a boy or a girl child. But those not-so-scientific methods are probably no more reliable than the results of the survey.

INNER EAR RUPTURE

A Technifacts reader wrote recently, "Regarding your article 'Inner Ear Rupture' by Dr. Becker, I would like to pass on some firsthand information. On Sunday, August 15, 1976, while wreck diving off Barnagat Light, New Jersey, I suffered what I thought was an ear squeeze. I completed my dive and returned home to Baltimore, Maryland, with a full feeling and a slight hearing loss in my left ear. There was no pain during the dive, dizziness or vertigo after the dive. I later learned this was rare."

The reader went on to relate the hap-

(Continued on Page 34)

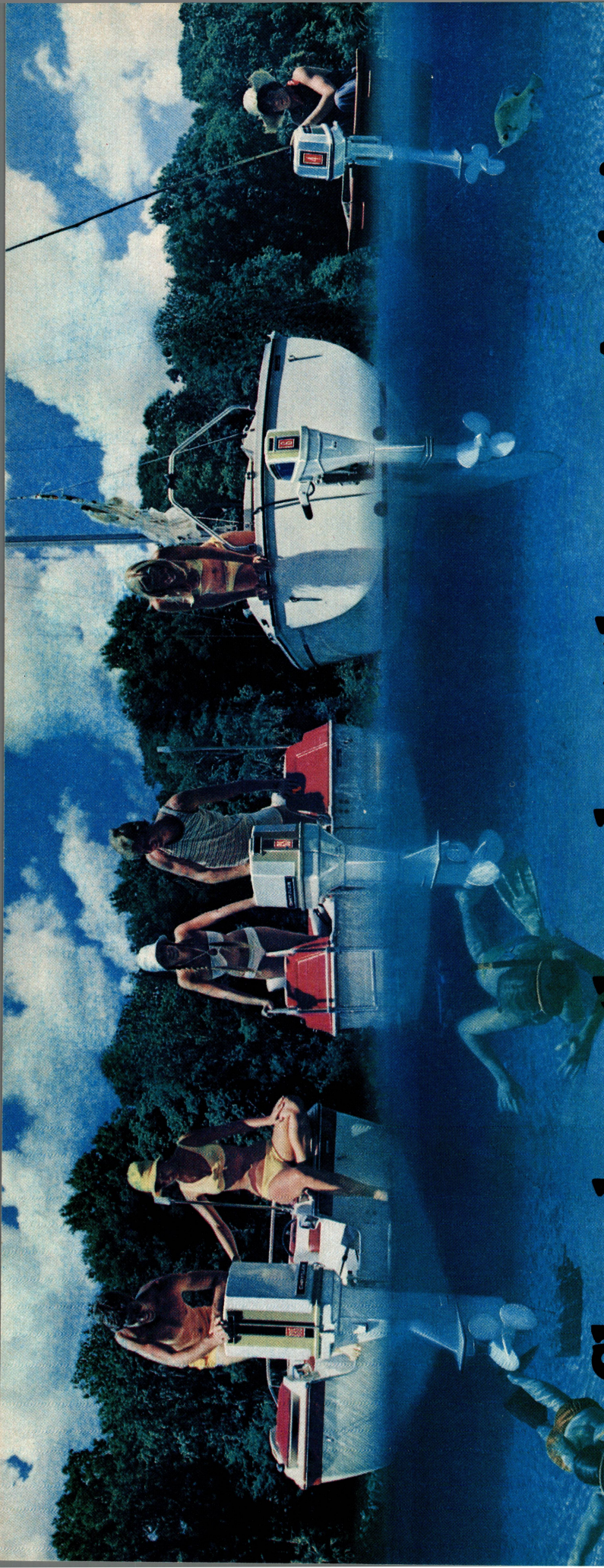


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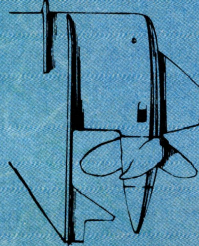
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tunnels (in Berlin, Germany), the new "Power Flow" shape means more speed from the same horsepower. More than 2 mph at speeds over 40 mph, or the equivalent of more than 10 extra horsepower free!

The Super 65. This clean, compact power package is the most powerful 2-cylinder anywhere. Also designed with a "Power Flow" lower underwater unit, it's economical, dependable and just what a boater needs to get going. Fast!

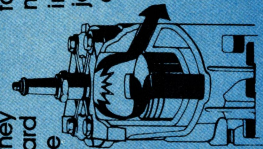


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Available in 6 and 10 hp., these workhorses with their unique underwater unit design are the most powerful sailboat auxiliaries in the industry. With a 3-to-1 gear ratio and 10" prop, they give 40% more forward thrust and double the reverse thrust.



The Zippy 4. This brand-new single-cylinder beauty is water-cooled to run silent and loop-charged to run fast. It's an extremely powerful,



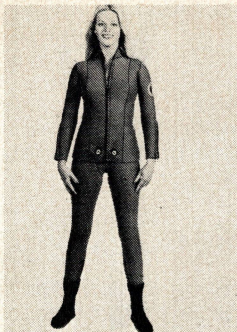
compact, lightweight outboard.

As you can see, it's a better time than ever to join the Chrysler Crew. Check the Yellow Pages today for your nearest Chrysler Marine dealer.

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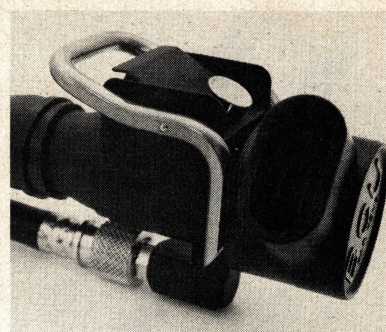
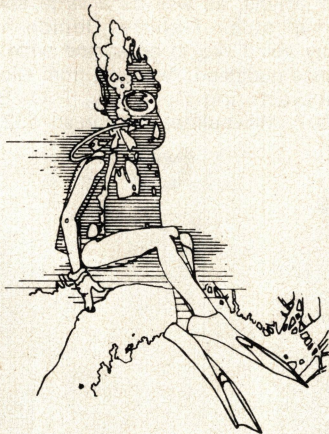


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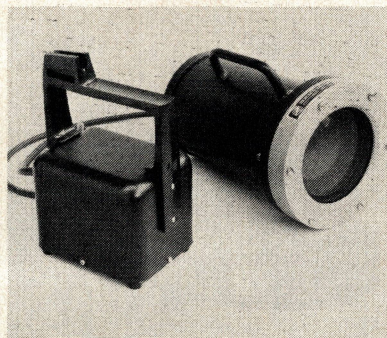


The Capri II features a high waist design with an extra zipper on the hip. Made of durable 1/4" nylon two, it is blue outside, black inside. The zippers are heavy duty nickel silver. Beavertails come with either twist locks or Velcro fasteners. All seams are lock-stitched after gluing for strength and warmth. It sells for \$129.95 at your local U.S. Divers dealer.

New Gear

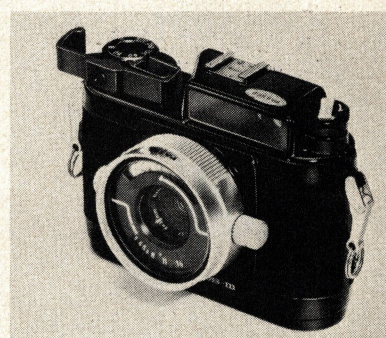
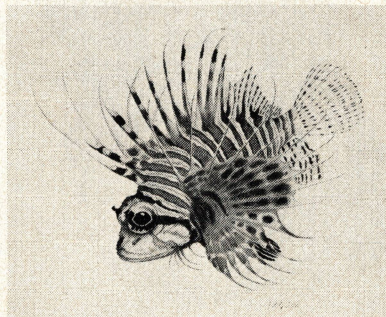


The Buoyancy Control Unit includes power inflation and deflation, automatic overpressure relief. It completely deflates BC's in 2-8 seconds. The BCU is easily adaptable to most BC vests. It features an ABS plastic mouthpiece, stainless steel and brass fittings, and a 36" LP hose with quick disconnect. \$59.95. Western Divers, P.O. Box 10131, Santa Ana, California 92711.



The Benthos Model 3985 Underwater Black Light is designed for nondestructive leak testing of welded underwater construction. Used with a magnetized fluorescent dye, the light reveals cracks and other defects not seen by the human eye. Housed in aluminum, it weighs 1.5 lbs. and is tested to 1000 feet. \$1,950. Benthos, Incorporated, Edgerton Drive, North Falmouth, Massachusetts 02556.

Hang a lionfish on your wall! A great gift for you, your favorite diver, or a fish-fiend friend, this color lithograph is certain to attract attention and admiration. By John Quinn, it is one of a limited edition of 1000 numbered prints. Each print sells for \$10, plus \$1.50 for postage and handling. Available from Creative Photo, P.O. Box 40, Concord, California 94522.

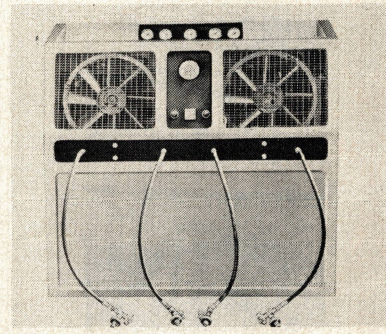


Convenient, one-hand operation of the Nikonos III shutter release and film advance is made possible with this one-piece trigger. The top-mounted frame counter, shutter lock and shutter speed are all accessible with the trigger in place. It sells for \$8.50, plus 50¢ shipping and handling. Available from Glenn Beall Industries, 887 S. Rte. 21, Gurnee, Ill. 60031.



A diver depends upon his regulator and gauges and those delicate instruments need special care. Protect yours with the 7417-10 Regulator Bag. It is cylindrical in design and accommodates a regulator, CPG gauge and depth gauge. It features a heavy-duty zipper, carrying tab and the Aqua-Lung® logo. It sells for \$7.50 and is available at your nearest Aqua-Lung® dealer.

The "Get Your Gear Together" system includes BC, inflator hose, pressure gauge and regulator. The 8BC1 has double-bag construction; the V1V inflator, chrome-plated LP connections. The DS111 pressure gauge is calibrated in English and metric. The MR12-II regulator has a vortex assist design. All for \$339.90. AMF Swimaster, 8801 S. Harbor Blvd., Santa Ana, Ca. 92704.

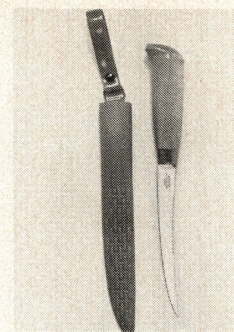


The R 400 is a twin compressor which has an output of 14 cfm and can fill four tanks up to 3150 psi in 20 minutes. It features push-button control, low-noise operation and a condensate drain system. Its two compressors can operate independently. Powered by a three-phase, 15 hp electric motor, it is \$7,100. RUH Air Compressors, 971 S.W. First St., Miami, Fla. 33130.

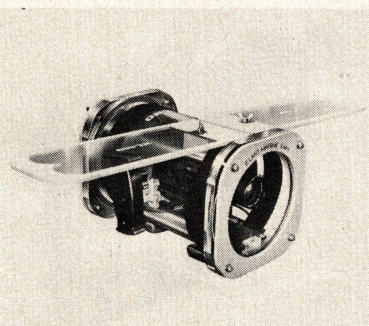


The Model 774 dive watch has a stainless steel case and is depth tested to 330 feet. It features a screw-down crown, one-way ratchet bezel and 17 jewel movement with Incabloc shock protection. The Swiss-made watch is self-winding and has an instant change day-date calendar. In French, Spanish or English, it sells for \$140. Aquadive, 3600 Wilshire Blvd., Los Angeles, Calif.

Now you can have a T-shirt printed with the name of your club or organization. The shirts are 100% cotton or 50% polyester. Also available are vinyl stickers and jackets, as well as a large selection of stock T-shirts. Decide how many you'd like to order and write for a price quotation. Available from Global Manufacturing Company, P.O. Box 15307, Milwaukee, Wisconsin 53215.

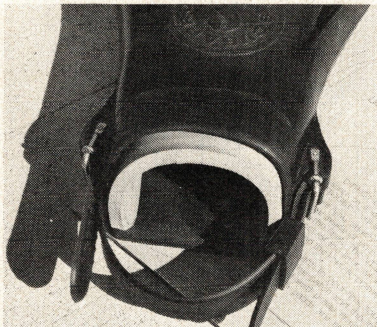


A rust-proof stainless steel blade and handsome wooden handle are features of the 4590 Fillet knife. It has a sharp edge as well as a serrated one, which makes it flexible enough to be used for all kinds of fish cleaning. The overall length of the knife is 11", the blade measures 6 1/2". It sells for \$9 and is available from Wenoka Cutlery, 85 North Ave., Natick, Ma.

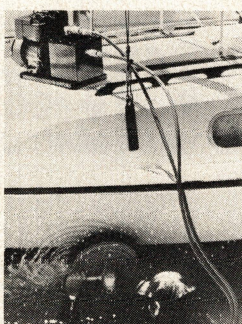


Expand your pursuit of 8mm movie-making with the Elmo Marine EM-1. This underwater camera housing features extra-wide stabilizer wings, which can be folded for carrying convenience. It also has an angle-adjustable hand grip and a strong, pressure resistant body. It can be used with almost all models of super 8 movie cameras. \$299.95. Elmo Co., Ltd., 32-10 57th St. Woodside, N.Y.

Flow Foam Fin Liners, made of a special foam plastic that flows around the contours of your feet, gives relief from pressure points on the instep and toes. You can cut them to fit any size fin. Velcro patches hold the liners in the fins, yet allow them to be removed for use with booties. The kit sells for \$6.95 a pair from Underwater Kinetics, P.O. Box 2125, La Jolla, California 92038.

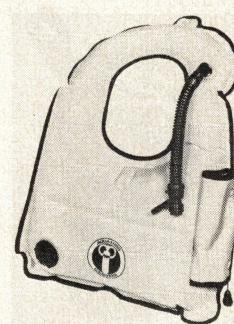


Protect your SuperSuit SunSocks from the roughest terrain with the Sole Slipper, a tough, knobby-rubber overboot. A toe and arch support add strength to your kick and give comfort to your feet. The boot has a low profile and will slide into your fin easily. The Achilles zipper makes it easy to put on. \$19.95. From O'Neill's, 1071-41st Avenue, Santa Cruz, California 95062.



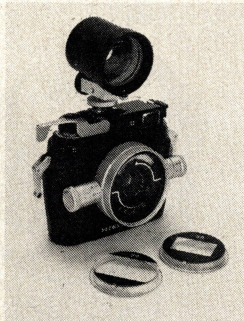
Hydra-Brush is a diesel-powered, portable system which can be used for hull cleaning, boat maintenance, salvage operations, underwater construction, piling and seawall cleaning. It comes with an assortment of rotary brushes and tools \$1,095. Optional, is a separate diver air compressor, \$200. From Custom Hydraulics, Incorporated, 6819 S.W. 81 Terrace, Miami, Florida 33143.

This unique harness arrangement distributes tank weight across the chest and shoulders. The single harness release allows you to take off your tank with a "quick flip." Molded of plastic with an adjustable band to fit all tanks, the A-256 Back Pack, complete, is \$34.95. The A-266 Harness only, is \$13.50. Aqua-Craft, Inc., 3280 Kurtz Street, San Diego, California 92110.



The Aqua-Master,® an economical BC, has heat-sealed seams for strength. It provides 30 lbs. of lift and features an automatic overpressure relief valve and an oral inflator. It uses a 38 gram CO₂ cartridge. The heavy-nylon, urethane-backed fabric resists cuts, punctures and abrasions. In yellow or black, it sells for \$52.75. Available at your nearest U.S. Divers dealer.

Easily secured to your Nikonos II or III, the Novatek Viewfinder, S-75, features a rugged, all-metal housing, fine glass optics and a set of three viewing masks for 28 and 35mm, as well as super wide lenses. Also featured is a vertical adjustment for parallax correction. Priced at \$45, it is available from Aqua-Craft, Inc., 3280 Kurtz St., San Diego, California 92110.

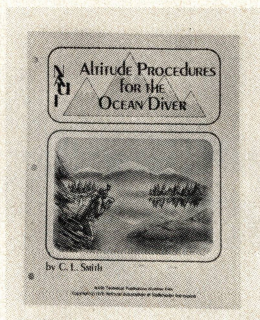
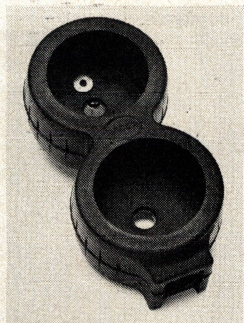


Tired of struggling into your wet suit? Ever Slide lubricant is a water soluble concentrate which makes donning and doffing your wet suit, gloves and booties easier. It can also be used for putting on ski jackets and water skis. The six ounce container is \$2.25. Available from Global Manufacturing Company, P.O. Box 15307, Milwaukee, Wisconsin 53215.

This compass can be read from either the top or the side. The LS-1 also features a rotatable bezel which remembers your desired course, or indicates bearings quickly, and a luminous dial for night or dark-water use. It is liquid filled for stability and durability and has a heavy-duty rubber strap. \$30. Scubapro, 3105 E. Harcourt, Compton, California 90211.

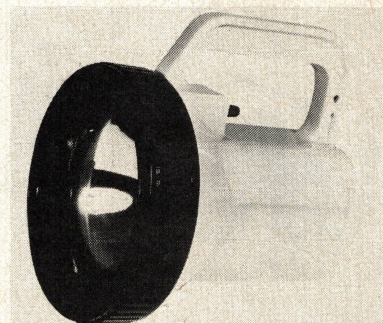


Contoured to fit the diver's hand, the Model ICB bare instrument console holds the Dacor model TAG underwater pressure gauge and any one of four Dacor oil-filled depth gauges. Made of heavy-duty rubber, the console casing absorbs shock to protect the instruments. It sells for \$6 and is available from Dacor Corporation, 161 Northfield Road, Northfield, Illinois 60093.

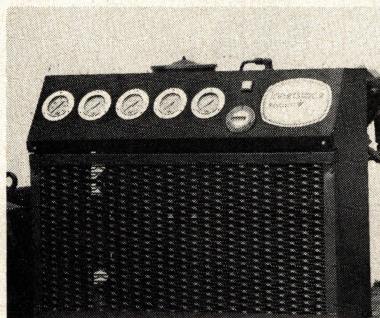
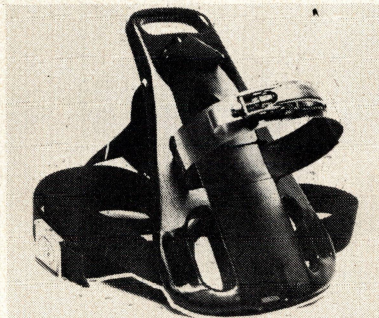


A valuable reference for anyone who plans to dive high mountain lakes, Altitude Procedures for the Ocean Diver contains a summary of the most current information, calculations, and 14 tables for different altitudes. Also included are general background orientation chapters. 50 pages long, the booklet is available from the NAUI Book Catalog for \$3.95. NAUI, Box 630, Colton, Calif. 92324.

A rated light output of 103,000 candle-power combines with the special, extra large parabolic curve on the lens to make the 7297 Brite Lite a very intense dive light. It runs for an hour and 45 minutes with each charge. The separate recharger operates from 115v AC or 12v DC. The housing and bezel are made of high impact ABS. \$79.95 at your local U.S. Divers dealer.

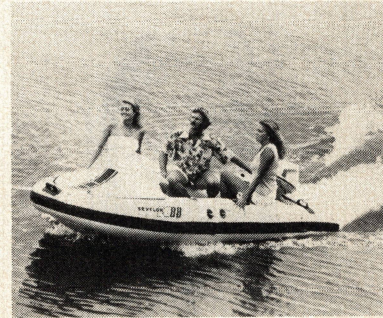


Contour-molded for your comfort while diving, the BP-2 quick cam back pack is easy to put on, or remove from, your tank. It has extra thick material at the handle and webbing entry area for extra strength. It comes complete with a nylon harness and quick release buckle. It sells for \$31.95 and is available from Seatec, 425 West Palmyra St., Orange, California 92666.

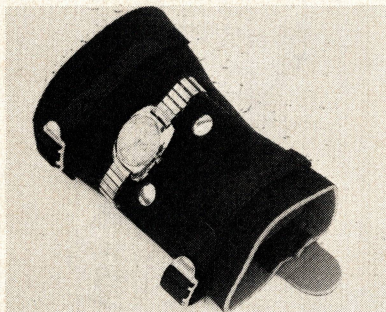


New from Innerspace Research and Worthington Corporation, this high capacity compressor pumps from 15 cfm to 20 cfm at 5000 psi. It is available with a diesel, gas or electric motor. Complete with filters and ready to operate, it sells for \$7,200. Also available are 3 cfm and 7 cfm units. Innerspace Research, 4780 E. 11th Avenue, Hialeah, Florida 33013.

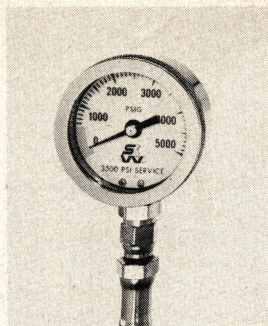
Completely portable, the K-88 Runabout can be deflated and stored in two heavy duty duffle bags. This 11 foot boat has a unique three-chamber hull construction. It is made of extra heavy Neopryl which is unaffected by sun, salt water and chlorine. Designed to use a ten hp motor, it sells for \$499. Sevylor U.S.A., Inc., 6279 E. Slauson Avenue, Los Angeles, California 90040.



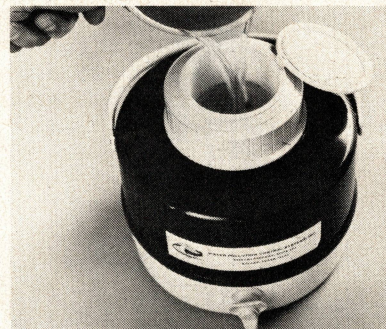
All your gauges and instruments can be put on and taken off in one easy operation with the Aqua Kinetics Instrument Sleeve. Made of neoprene rubber with a nylon zipper, it features two nylon straps for your compass, temperature and depth gauges, and a separate snap-button strap for your watch. \$15.40. Global Manufacturing Company, P.O. Box 15307, Milwaukee, Wis. 53215.



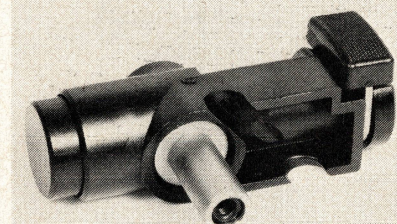
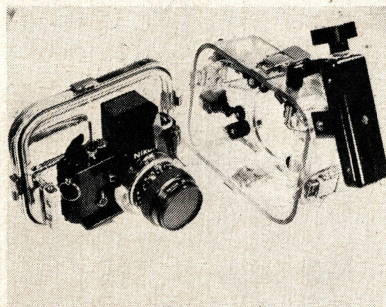
This new Sea-View underwater pressure gauge features a chrome-plated brass housing. It has a large 2" luminous dial for easy read-outs, 3500 psi service pressure and a spiral-wound bourdon tube attached to the gauge pointer for accuracy. The Sea-View is \$58. An optional protective rubber cover is also available. From Sportsways, 2050 Laura Ave., Huntington Park, Ca. 90255.



The purification system of the Puri-Jug makes it possible to enjoy microbiologically pure drinking water anywhere. A filter device built into the cap destroys bacteria as the water is poured into the jug. The one-gallon jug can also be used for hot or cold drinks. It sells for \$39.95 and is available from Water Pollution Control Systems, Inc., 6350 LBJ Freeway, Dallas, Texas.



The new Ikelite SLR Case for 1977 features a gear drive aperture ring which is installed on the camera lens. It meshes with gears in the housing for positive control when changing f stops. The redesigned back has 22½v battery/capacitor pac for use with Ikelite solid state triggering systems for strobes. \$169.95. Ikelite Underwater Systems, 3303 N. Illinois St., Indianapolis, Ind.

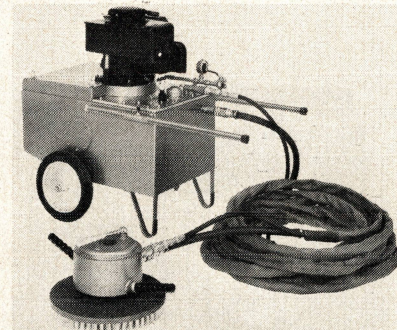
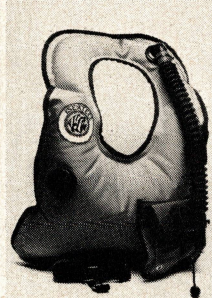


The 7033-50 Tire Inflator is a handy little device which allows you to save your energy for the important things in diving by filling your tire or surface float. It can also be used to fill an inflatable boat. It operates from a low pressure hose attached to your scuba tank. New for 1977, it sells for \$8.90 and is available from your nearest U.S. Divers dealer.

The world beneath the waves has been captured in brilliant color on these Jerry Greenberg postcards. In singles or folding strips, "Seascapes" uses regular postcard stamps. Individual cards may be purchased at your local dive shop. All 30 cards, plus a free gift of a folding postcard strip, may be purchased for \$5 from Seahawk Press, 6840 S.W. 92nd St., Miami, Fla. 33156.

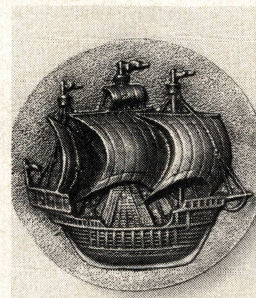


Designed for the diver who wants adequate buoyancy but doesn't want to spend a lot of money, the DV-201 BC features an oral inflator hose, over-pressure relief valve and utility pocket. It uses a 16 gram CO₂ cartridge. The DV-201 can also be used with the Seatec push-button mechanical inflator. In yellow, black or orange, \$49.95. Seatec, 427 W. Palmyra, Orange, Calif.



Easy to operate and highly efficient, the Marina System is designed to clean any boat's hull — especially commercial vessels up to 400 feet. It can clean up to 3800 square feet per hour. In addition, the power unit can be used to operate hydraulic tools such as chain saws, drills, cable cutters and impact wrenches. \$6,900. From U.S. Phosmarine, 3186 Airway Ave., Costa Mesa, Calif. 92626.

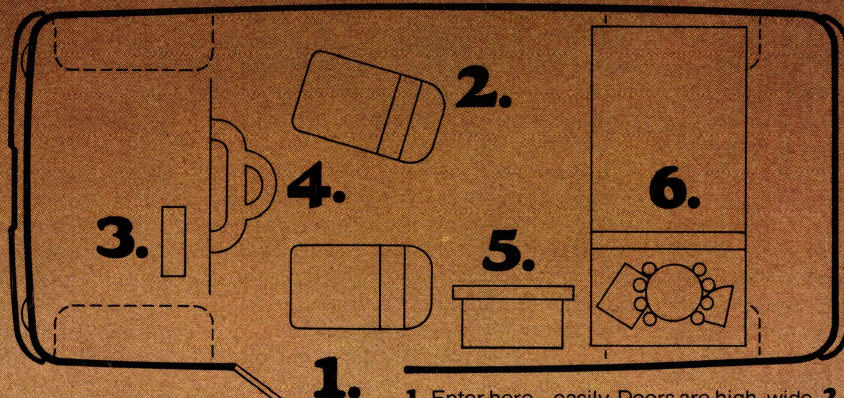
Here's a distinctive belt buckle that an avid wreck diver will love. It features a three dimensional Spanish galleon cast in a pewter alloy with an antique brass finish. It won't tarnish, mar or scratch. Replacement is guaranteed for one year if there is a defect in workmanship. \$6.95. Creative Metals, Ltd., 13 Roosevelt St., Lake in the Hills, Ill. 60102.



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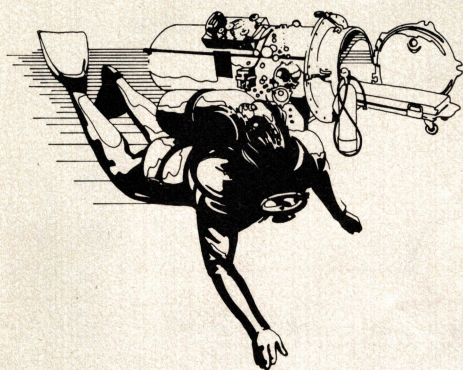


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Medifacts

Hypoxia

By Charles V. Brown, M.D.

Jerry was seated at a desk, writing, while the rest of us medical students gathered 'round and stared. Jerry was wearing a nose clip, and was breathing through a CO₂ scrubber into and out of a rubber bag. With each breath, the oxygen in the bag became less. He had been instructed to spit out the mouthpiece and breathe room air at the first sign of distress.

Jerry began to giggle, and his penmanship became less precise. Soon he was breaking up over weak jokes and producing meaningless nonsense in semi-legible scrawls. Then he passed out. The thing to note is that he had no idea anything was wrong — he thought he was doing fine. Nor did he later remember any problem.

The primary stimulus for breathing is elevated CO₂ tension. Hypoxia stimulates breathing too, but only late in the game, and without conscious awareness of distress. That's why Jerry failed to rescue himself.

Interesting, but need this sort of hypoxia concern divers? It had better, since they keep finding odd ways to achieve it. Some have contrived simple oxygen rebreathers, apparatus similar to Jerry's except that the bag is initially inflated with oxygen, and more is added from a small supply bottle whenever it empties. Users have died when they forgot to also flush their lungs with oxygen before using the rebreather; nitrogen from air left in the lungs gets into the bag, which therefore doesn't empty as oxygen

is consumed, and the diver passes out without realizing he needs more oxygen.

Other divers have discovered air pockets in wrecks, and removed their regulators to enjoy a subsea conversation, quite ignoring the likelihood that any oxygen in that "air" was long since consumed. Divers with access to military, commercial, or scientific supply banks have, through carelessness or ignorance, filled their tanks with a low oxygen mixture intended only for very deep diving, or even with pure nitrogen or helium.

One innocent fellow went diving with a tank that had been stored for months; unfortunately, moisture inside had led to rust formation, consuming its oxygen, and he succumbed without realizing he'd been trying to live on nitrogen. But let's say you're a head-screwed-on-right, no-nonsense type who'd never fall for such traps. You're in a high altitude lake, working like mad to salvage some goody before your air runs out. You're doing great, breathing compressed air. But when you surface exhausted, the low oxygen atmosphere is bad news. Any emergency need for exertion at that moment will be a lost cause.

The textbooks do list symptoms that warn of hypoxia. The first is inappropriate mood. In Jerry's case it was hilarity and overconfidence, though often it will be hostility and fixation of ideas. When an airliner flew too high, the passengers' jocular banter shaded to angry recriminations. A climber on a high mountain pass could barely contain his urge to kill a best friend over some fancied insult. Other symptoms are apathy, fatigue, headache, and double vision.

It is possible for a person to recognize his own symptoms in time to take corrective action, especially if hypoxia is not too abrupt, but only if he's trained for this and remains constantly attentive. In practice, an affected diver will virtually always konk out without warning.

Signs of hypoxia, on the other hand, are far more obvious. (Signs are seen by an observer, as opposed to symptoms, which are felt by the patient.) Outstanding are inappropriate behavior, clumsiness, and poor job performance, but underwater, only an unusually attentive buddy would spot these in time to help. Since among body tissues the cerebral cortex is most sensitive to hypoxia, loss of consciousness is an early event, and apt to be disastrous. Other signs such as cyanosis and increased pulse rate and blood pressure are useful only in evaluating a patient topside.

We've been discussing the pure form of hypoxia, in which ventilation is adequate, but the breathing gas lacks enough oxygen. Much commoner are mixed forms, in which the breathing gas has a normal complement of oxygen, but ventilation is inadequate. This produces varying degrees of asphyxia, meaning that hypoxia is coupled with CO₂ elevation. While the hypoxia is still the graver

disorder, the CO₂ aggravates the damage and adds conscious distress.

These problems come about in two ways. The first is relative hypoventilation. You're working hard, so you breathe your darndest, but it's still not enough for the exertion level. Perhaps your air transport is limited by some lung disorder, or equipment resistance, or excessive dead space, or restrictive garments. Or maybe you just bit off more than you could chew, say fighting a stiff current, or trying to keep a heavy-laden goody bag afloat through a long swim. A subtler hazard is to work yourself up to maximal sustainable exertion on the surface, and then have to suddenly go on regulator, say when you hit big surf. That regulator won't deliver anywhere near the ventilatory volume you've come to need, and you're in big trouble.

Whatever the reason, the result is exhaustion and imminent danger of drowning. Yet more than sheer physical incapacity is involved here, according to certain mice. These unwitting experimental subjects swam in a big jar until apparently exhausted, then sank. But if rescued at once and returned to their cages, they immediately began running in their exercise wheels just as if nothing had happened, ruining the exhaustion theory. They had quit because they were discouraged and saw no point in going on. On a second trial, the same mice swam twice as long before giving up.

Eventually, of course, exhaustion becomes insupportable, and even the lion-hearted must succumb. A brave effort at increased performance might succeed briefly by increasing the oxygen debt, but this is quickly limited by build-up of toxic waste materials.

The second way to asphyxia is that dread specter, sudden loss of air supply. It could only happen to an idiot, you say? Maybe so. I managed it twice — once by grabbing the only tank on the boat that had not been filled, and once by neglecting to spot the leak where the new regulator hose was screwed loosely into the first stage. Others have run out of air as a result of entrapments, or buddy breathing, or unexpectedly heavy exertion. A common situation has been to lose one's bearings in a cave or under ice.

A more unique embarrassment is to lose your air to an incensed sea creature. One Tektite biologist had a bad moment when a large lobster (Eastern type, with claws) took his regulator and wouldn't give it back. Some Puget Sound octopus wrestlers have had theirs purloined by opponents who didn't seem to care for the rules. Biologist Bill High tells me the beast isn't really guilty; the diver, in pushing away a tentacle that happens to be wrapped around the hose, dislodges his own regulator.

Hypoxia is a feature of many other aquatic disorders, and a look at some of the mechanisms involved will help one understand what goes on and what to do

about it. Nothing in this world happens without expenditure of energy, and people get theirs by metabolically burning fuels with oxygen. Our bodies stockpile the fuels but not the oxygen, so a continuous delivery system is indispensable. And since oxygen is utilized only in the cells, the system must deliver it there. Besides adequate oxygen in the breathing gas and adequate ventilation (discussed already), there must be unhampered diffusion of oxygen across the alveolar membrane, enough hemoglobin to tote it, adequate blood volume, and sufficient heart action to move it.

Diffusion block occurs when alveoli contains water or edema fluid, or when they're collapsed, as in drowning, secondary drowning, and pneumothorax. Carbon monoxide intoxication eliminates hemoglobin as an oxygen carrier. Shock reduces the blood volume so that effective circulation does not occur. Cardiac dysrhythmias compromise the heart's effectiveness as a pump. And decompression sickness or air embolism bubbles in the blood block circulation through tissues.

Individual oxygen requirement is highly variable, depending on the person (size, build, condition, adaptation), environmental stress (cold), and activity level. An average young man, for instance, might consume 250 cc of oxygen at rest, and seven or eight times that much during a one knot swim. Most of us extract our oxygen from air which assays out at 21 percent; we'd weaken as the level dropped, and pass out at about ten percent. Abrupt shut-off of oxygen supply to the brain by carotid artery compression (the so-called judo choke-out) produces unconsciousness in about eight seconds. With sudden apnea (not breathing), consciousness may last from about one and a half to several minutes, and cardiac arrest is likely within five minutes. After primary cardiac arrest, there may be four or five minutes till permanent brain damage, and a few more until certain death. Note however, that all these times would be much less where a person had been exercising strenuously and was already in oxygen debt, or where he struggles to save himself after apnea begins. Special circumstances like hypothermia and perhaps reflexes such as diver's reflex have occasionally permitted far longer survivals, probably by reducing metabolism and by shunting blood from other tissues to heart and brain. Therefore, don't neglect resuscitation attempts just because it seems too late.

In dealing with hypoxic victims, pure oxygen is the ideal supplement, but rarely the whole treatment. The first consideration must always be establishment of an open airway, and cardiopulmonary resuscitation. Then an effort must be made to identify and treat the underlying disorder. Emergency transport to a medical facility completes your job. >



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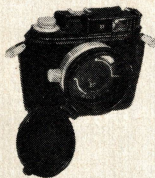
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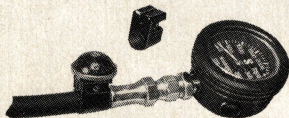
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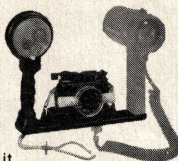
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Technifacts

from a Master Diver



(Continued from Page 25)

penings over the next few days. Monday morning he suffered a gradual hearing loss; Monday evening, a serious case of vertigo, after which he called his doctor who made arrangements for them to meet at the hospital. Tuesday a.m., the diver returned to work but at midday suffered an attack of vertigo and by 3:30 p.m., had completely lost his hearing in the left ear. His doctor determined the eardrum was intact. Tuesday p.m., the diver again suffered extreme vertigo and was admitted to the hospital. There it was necessary to perform a three and a half hour operation to repair inner ear damage with only a 50-50 chance of regaining his hearing. By September 3, 1976, this reader was just beginning to get some of his hearing back.

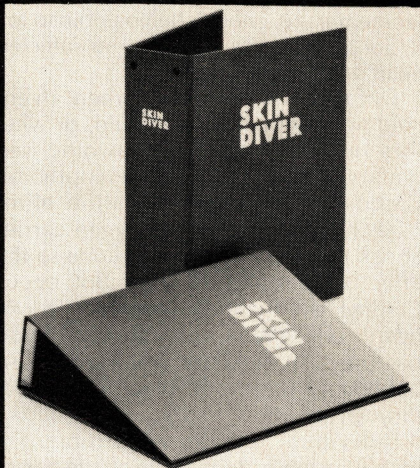
This diver added, "One thing I want to emphasize is the need for the certification agencies to stress more the very real possibilities of permanent damage to the ears. I am a certified diver but we were not cautioned about this except a brief word about rupturing an eardrum. Also, in my opinion, if a diver should experience any problem in equalizing he should abort the entire dive, regardless of how inviting the water seems. I only wish Dr. Becker's article had appeared a month earlier."

EMERGENCY AID FOR DIVERS

One of the proposed requirements in the temporarily aborted OSHA Emergency Temporary Standards for Diving Operations stated, "Prior to the commencement of any diving operation, several requirements must be met. A list of available sources of emergency aid, equipment, and professional assistance, and instructions for establishing contact with them in case of emergency, must be available at the work site as well as at any field operations office or principal place of business. Two-way communications necessary to the requisition of such emergency aid must be available or accessible to the worksite."

Simply stated this means that you, the diver, should know how and from whom to request aid and have a method of getting emergency help such as equipment, professional people or instruction. In Hawaii, one of the most frequently occurring emergencies is decompression sickness. Another is that of lost (usually temporarily) divers. Because of the frequency of the various emergencies, a dive accident procedure has been established for the Hawaiian Islands. You

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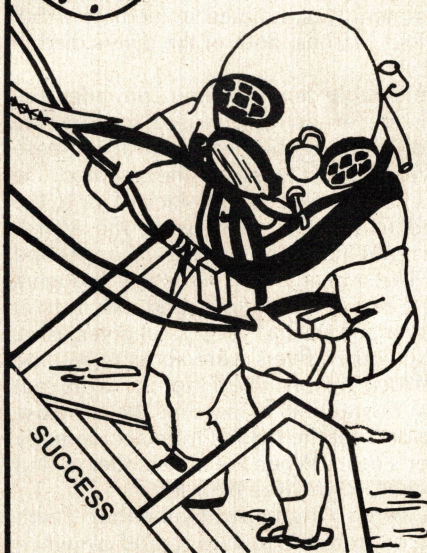
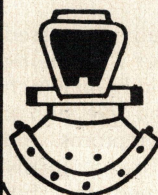
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might want to establish such a procedure for your area.

Divers on all islands in the Hawaiian chain are advised to call the U.S. Coast Guard in case of bends, air embolism, or for any ocean emergency. Direct dialing for Hawaii's Coast Guard is 536-4336, or call Coast Guard Communications on Channel 16, Marine Radio VHF-FM.

At present the island of Oahu is the only one with recompression chamber facilities to treat dive accidents. Most patients with bends and other diving-related problems are taken to the U.S. Naval Submarine Training Center at Pearl Harbor. There they maintain two chambers and a 24 hour standby staff. If both these chambers are in use, divers can be treated at the Harbor Clearance Unit 1 chamber, also at Pearl Harbor. There are other chambers installed on Oahu but they are not always manned or staffed by qualified personnel.

Divers on islands other than Oahu (Maui, Molokai, Lanai, Hawaii or Kauai) should still call the U.S. Coast Guard. They will then be evacuated by air to Oahu for treatment in one of the available chambers. Also, the Coast Guard will coordinate all transportation arrangements with ambulance, helicopter, Fire Department, and, if necessary, C-130 aircraft. The Coast Guard will also notify the recompression chamber and hospital to stand by. The Coast Guard says, "We can get emergency service faster than any ordinary citizen."

The key to a quick rescue and treatment is to have some form of communication by which emergency help can be summoned. If in a boat, radio communication equipment should be available. If near shore, know telephone numbers to request aid. Emergency flares can also be used to attract attention and possibly help. When dives are planned in areas or at times when no form of communication with shore or emergency personnel can be established, be sure at least one reliable person knows where you are going to be diving, when you plan on leaving, and when you plan on returning. It is then imperative that the dive be carried out as planned. Again quoting the Coast Guard, "The key to a successful rescue is to make sure somebody knows you are in trouble." Telephone, radio, flares, or the fact that you did not return from a planned dive on time, are ways of making somebody know you are in trouble. Rescue and/or treatment are then possible.

NAUI has published a list of locations, worldwide, of recompression chamber facilities. You should be able to get a copy from their main office or through a NAUI instructor.

Also Technifacts has available on request, copies of dive plan sheets (two pages) that divers who care about their safety can use to file a dive plan. Write to Technifacts, SKIN DIVER Magazine, 8490 Sunset Boulevard, Los Angeles, California 90069.

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DIVING AS A GUEST OF THE EMPEROR

By Bob Sheats

"Dive or Die." "The War's Greatest Snafu Treasure Hunt." "The Great Manila Bay Silver Operation." These are the titles of magazine articles that attempted to portray the deeds of myself and eight other U.S. Navy divers who were captured by the Japanese forces in the Philippines in the early stages of World War II. Rather than call ourselves P.O.W.'s, we coined the euphemism "guests of the Emperor."

My motivation for writing this story is centered in a belief that history needs to be a product of truth! I have been interviewed by a number of writers who wished to tell the story of our dive adventure. But, alas, their final stories contained inaccuracies, distortions, and, in some cases, outright falsehoods in the literary effort "to make it readable."

In the hope that truth requires no embellishment, I am documenting our adventures during the dive operations as my memory serves me and with the aid of my war diary. I am also able to draw upon the memories of three of my diving comrades who live near me in the Great Northwest.

The background for my story begins shortly after the surrender of Bataan to the invading Japanese forces on April 9, 1942. My ship, the submarine tender *USS Canopus*, had been bombed and scuttled at the mouth of Marivelles Harbor on the Bataan Peninsula. The majority of the surviving crew, including most of the divers, had been transported by small craft to the island fortress of Corregidor several weeks prior to the surrender of Bataan.

Being a qualified machine gun operator, I had been assigned to an outpost machine gun nest in the jungle perimeter protecting Marivelles Harbor. On the night of the surrender of Bataan, my crew and I were able to disassemble our two .50 caliber, water-cooled machine guns, load them into a motor launch, and escape to Corregidor under cover of darkness.

During the ensuing weeks it became obvious that Corregidor's days were numbered. A major effort was made by the Army and Naval commands to destroy or dump into the sea excess materials that might benefit the Japanese forces. (This was material that had been stored in the rock-hewn tunnels of the fortress island.) Although some of the gold and silver bullion had been shipped out on the *USS Trout*, an American submarine, there remained over 15 million pesos in silver, worth over \$8,000,000, to be disposed of.

A decision was made to store the 350 tons of silver in wooden boxes and dump them into the deep water between the fortified islands of Corregidor and Ft. Hughes, which also remained in American hands. Each 24 x 14 x 14 inch box was filled with 6,000 pesos and weighed about 300 pounds.

Shortly before the fall of Corregidor, the boxes were dumped from barges by working parties composed mainly of Naval personnel, including several of the divers from the *USS Pidgeon*, a submarine rescue vessel anchored in the vicinity of Corregidor. Navigational cross-bearings were taken at the dump site, and silver was jettisoned under cover of darkness to conceal the action from the Japanese forces on Bataan.

Water depth at the dump site was about 120 feet. Its approximate location was ascertained from unknown sources by the Japanese shortly after the surrender of Corregidor on May 6, 1942. They hired eight Filipino divers, and an equal number of pump hands, to recover the silver. The divers had worked in the shallow waters of Manila Bay, but were inexperienced in deep diving techniques, and had absolutely no knowledge of

decompression procedures for the prevention of bends.

Captain Takuichi, of the Japanese Army Engineers, was placed in charge of the operation, and he selected a Mr. Yosobe as his salvage master. Yosobe was a small, mild-mannered Japanese man who had lived in the Philippines for a number of years, and worked for the Luzon Stevedoring Company. Yosobe had experience in supervising Filipino workers in salvage, although his superiors were Americans.

A native barge, called a "casco," was fitted out as a diving platform for the Filipino divers, and towed to the area where the silver had been dumped. The casco was a flat-bottomed barge about 60 feet long and 12 feet wide. The dive equipment consisted of the U.S. Navy MK-V diving dress and helmet and some obsolete hose. Air was supplied by an old U.S. Navy MK-III manually-operated dive pump. Designed to supply air to a maximum depth of 90 feet, it would not furnish adequate ventilation for safe diving at deeper depths.

From the beginning, the inexperience of the Filipino divers courted disaster. Dive operations commenced during the latter part of May, and the silver was located almost immediately. The divers experienced headaches and fatigue (both symptoms of carbon dioxide excess), and shortly after surfacing, one of the divers was stricken with a painful case of bends. Lacking the proper knowledge for bends treatment, the diver was given a vigorous massage. The pain disappeared in a few hours, and the divers returned to work.

Several days passed, and the divers gradually increased their time on the bottom. A few boxes of silver were being raised with the aid of a long wire strap and an old hand winch mounted on the casco. One evening, after a long dive, two of the divers were stricken with serious bends' symptoms, and both lost consciousness shortly after surfacing. The previously successful massage treatment was initiated immediately, but was ineffective, for obvious reasons. Both of the divers died in agony during the night.

Terrified by the unexplainable deaths of their comrades, the remaining divers, with one exception, refused to continue diving. Tempted by the offer of a sizable bonus and an increase in pay, one Filipino diver decided to try another method. He reasoned that the bends had been caused by lack of air to the dive suit, and decided to make a dive using the Morse shallow water helmet. This helmet is made of spun copper and sits on the diver's head like a diving bell. Air is fed through a gooseneck fitting on the top of the helmet and exhausts at shoulder level. The diver made several successful dives using the Morse helmet, and the other divers were about to resume diving when tragedy struck again! The Filipinos were not familiar with the safety precaution of passing the air hose under the diver's arm to prevent the helmet from accidentally being pulled off the diver's head. When the dive tender pulled the helmet to the surface no diver was with it.

The remaining divers were so frightened by the third death that no amount of urging or promised rewards could convince them to continue diving. The Filipinos had salvaged 18 boxes of silver worth about 100,000 pesos.

In the meanwhile, the majority of the surviving U.S. Marine and Naval personnel had been marched and shipped in cattle cars to a prison camp at Cabanatuan, about 100 kilometers north of Manila. In the latter part of June, the Japanese ordered six prisoners, all divers from the *USS Pidgeon*, to report to



Japanese headquarters. These men were V. L. Sauers, P. L. Mann, G. McCullough, W. A. Barton, C. Giglio, and M. Solomon. They were told that the Japanese knew they were divers and they were being sent to Manila to conduct dive operations. It would have been futile to have protested, and all felt that they would have a better chance to survive and possibly escape in the Manila area.

This group of six divers was taken to the dive barge which the Filipinos had used and told they would dive for boxes on the bottom. After a quick look at the unsafe equipment, "Jughead" Sauers, the senior diver, decided to experiment using the Morse shallow water helmet with the MK-III hand pump to see if diving could be made relatively safe.

Several of the divers made a trip in a Japanese fishing boat to the bombed out skeleton of the Dewey dry dock in Marivelles Harbor and found some dive gear which had been left by the *USS Canopus*. Also retrieved was some newer dive hose, dive underwear, and nonreturn valves. The next ten days were spent overhauling the equipment and making plans for the dive operation. It was evident by this time, through their contact with the Filipinos, that silver was the object of salvage and they also knew of the three Filipino dive fatalities.

On July 8, Jughead Sauers made the first dive. Even with the Filipino pump hands exerting maximum effort to turn the pump handles rapidly, the air supply was barely enough to keep the water from rising above his chin. With each inhalation the water rose to a point just below his mouth. This, of course, meant that should he bend over at any time during the dive, the water would rise over his face.

When Jughead reached the bottom of the descending line at a depth of 120 feet, he saw boxes stacked one upon the other in a huge pile, with the lower boxes partially buried in the soft silt. He connected a lifting wire to one of the boxes and signaled on the lifeline and air hose to be brought up. An added danger to the operation was the absence of decompression tables. Relying on memory, it was decided to decompress for 5 minutes at 20 feet and 7 minutes at 10 feet. When Sauers reached the surface and the box of silver was raised, Captain Takuichi gave Jughead a bottle of Scotch whiskey for his efforts. Three other boxes of silver were raised on the first day.

During this time, I had been at death's door with a combination of bacillary dysentery and hepatitis and would have been too weak to work as a diver so I and two other divers from the *USS Canopus* had been left behind in the prison camp. (Later we could only presume that names of the nine divers had been furnished to our captors by the surviving diving officer, who later died aboard a prison ship.) On August 3, G. Chopchik, C. Anderson and I joined the dive operation already in progress.

My arrival on the scene was especially welcome for I had in my possession an old dive manual with its antiquated decompression tables. A total of 28 boxes had been raised.

We held a clandestine meeting in the hold of our living barge and decided that our best course was to appear to cooperate with the salvage operation while doing as much as we could to prevent or delay the silver recovery. It was obvious that the Japanese could eventually salvage the silver. Our plan was to bring up boxes on some of the dives and on other dives to tell Yosobe, the Japanese salvage master, that we were unable to locate the boxes. It was also decided that Giglio was too inexperienced to engage in the hazardous diving involved, so he was unanimously voted the position of cook and housekeeper. He did an outstanding job of making a home out of our living casco, aided by our acquisition of items from the abandoned tunnel areas on Corregidor.

The boxes of silver were scattered over a wide area. Nearly 3000 boxes had been dumped, but after the cross bearings had been taken, the barges were allowed to drift during the time necessary to offload. In some areas the boxes were in high piles, in others widely scattered. We found that, although being in the salt water for only a few months, some of the boxes were beginning to deteriorate, and with a moderate amount of

effort, we could break open the ends of the boxes. This presented an area of sabotage to us and most quickly agreed that by opening the boxes we could impede the salvage effort and benefit ourselves by pilfering small amounts of silver pesos. McCullough smuggled a marlinspike (a sharp-pointed, heavy metal tool) to the bottom, and we used it to break into the boxes when our schedule didn't call for a recovery.

Prior to my joining the diving, the divers had smuggled up small amounts of pesos in their tennis shoes and under their dive underwear. I had brought with me an old, hard rubber face mask which I had used before the war. With the aid of my antiquated mask, makeshift bags composed of dungaree pant legs, and an old gas mask bag, we devised a method of stealing a significant amount of silver. We used a special signal of ten pulls on the air hose when the diver had a bag of silver with him. A weighted line with a snap on the end was dropped over the opposite side of the barge from where the heavy box was to come aboard. I would enter the water with my face mask, ostensibly to ascertain whether the diver's air hose was clear of the retrieving wire connected to the box of silver. I would then swim underwater to the opposite side of the barge, grab the line, and take it to the diver while he was decompressing at the 20 foot stop. He would secure the snap to the bag of silver and allow it to swing free.

After the diver was on board and with all hands working to bring the box of silver on deck, several of us would form a screen while one would haul the bag of silver over the opposite side of the barge. The bag was then dropped into a bucket and quickly covered with dive underwear. It was a masterpiece of deception to carry a heavy bucket full of silver and pretend it contained only dive underwear.

The Filipino pump hands were aware that we were stealing from the Japanese, but even they were not aware of our techniques. Some of the confiscated silver was given to the pump hands, and they were able to exchange it for additional food for us beyond our normal prison camp fare. It is possible that even Yosobe was aware of our duplicity, but if so, he was careful not to reveal his knowledge.

In the sequence of a typical dive, we would commence with pre-dive preparations. The diver would first conceal the loot bag under his dive underwear, check the helmet nonreturn valve, and don an old pair of tennis shoes to protect his feet. He would then enter the water on the ladder, the Filipino pump hand would commence pumping, and the tender would lower the helmet over the diver's head. Another tender would hand the diver a loop at the end of the 3/16 inch recovery cable. The diver would signal two pulls on the air hose for "give me slack," and slide down the descending line.

If our schedule called for the diver to recover a box of silver, he would attach the loop of cable around the end of a box of silver and signal three pulls on the recovery wire to take up the slack. He would then proceed to an open box, fill up the loot bag (about 500 pesos), and sling the bag over his shoulder so he would have his hands free to climb the descending line. If no open box was near, it was a simple matter to remove the marlinspike from its hiding place in the lay of the descending line and open the end of a box.

The diver would then signal three pulls for "take up the slack" followed by four pulls for "haul me up." The tender had to be careful to take up the slack gradually so as to not pull the helmet off the diver's head, for even though the loop of hose under the diver's arm prevented him from losing the helmet, when the helmet was lifted the water level rose above the diver's mouth. The diver would then ascend to the 30 foot stop at the old rate of 25 feet per minute. The decompression table for 20 minutes at 130 feet called for 2 minutes at 30 feet, 3 at 20, and 8 at 10 feet (tables of 1930 vintage). When the diver would signal 10 pulls for "I have a bag of silver," the tender would answer 10 if the coast was clear. If no answer was received, the diver would dump the bag. It was a beautiful sight to watch the silver pesos falling on their twisting erratic

flight back to the ocean bottom!

On one occasion I had just reached the 30 foot stop and was bending over attempting to place my foot in the loop of the descending line which marked the stop, when my helmet was suddenly jerked sideways and off my head. The loop of hose under my arm prevented me from losing the helmet, but my face was underwater, and I was being drawn sideways rapidly. I jettisoned my bag of silver, slipped out of the helmet, and commenced swimming for the surface. As I neared the surface, I became aware of the air expansion in my lungs and suddenly realized I hadn't exhaled! I immediately dumped all of the air from my lungs. This, of course, gave me extreme negative buoyancy, and I was barely able to make the surface. Even though I had been taught the principles of free ascent techniques, I had never made an ascent, and could easily have been entered on the air embolism fatality side of the statistical ledger. (The value of this lesson should not be lost by dive instructors who teach theory without practical implementation of practice.) The reason for the near accident was that my lifeline and air hose had been fouled in the recovery cable, and my tender had not noticed it.

When we were on dive operations, the handling of the recovered silver was always supervised by a member of the Japanese special military police force called a "Kempe Tai." The Kempe occupied a position of overall supervision, but was not normally qualified to make decisions regarding dive safety. This allowed us to make some decisions ourselves and gave us an additional area to slow down the recovery operations. If we told Yosobe that the currents were too strong to dive safely, he would relay our report to the Kempe, and we would secure diving for that day.

One day we told Yosobe that we would have to quit diving due to high currents and no visibility, but the Kempe insisted that we continue. In the ensuing confrontation, we used our old fallback about the three dead Filipino divers, and the Kempe said that he was not a coward, so he would dive. This presented a sudden unpleasant problem! At the bottom of the descending line was the 16 inch marlinspike protruding from the cords of the lay of the line. And, connected to the same line was a 50 foot circling line with the end secured to a broken box of silver for our special program. If the Kempe got down and back, we were likely candidates for a firing squad.

There was only one course of action open. We had discussed this eventuality among ourselves and had decided that an investigating Japanese diver must not be allowed to return alive. The Kempe undressed and carefully prepared to dive, while "Moe" Solomon offered his solicitous advice on how to surmount the many hazards of the dive. I was selected as the tender most likely to bring back the helmet without the diver inside, and was lowering the helmet over his head when he changed his mind. (Speaking for myself, I feel I would not be writing this account if he had continued the dive.)

On another occasion, while we were gathered at the dive station watching a box of silver breaking the water, we were horrified to see our marlinspike underneath the wire strap choking the box. When the box was on deck, we could hear Yosobe and the Kempe excitedly talking to each other in Nipponese and pointing to the marlinspike. "Punch" Barton was the diver, and his nickname is self-explanatory. When Punch came on board after the dive, he not only told Yosobe he didn't put it there, he also insisted to us that he had no knowledge of its presence. Luckily, Yosobe and the Kempe did not associate the marlinspike with sabotage, and later we were able to smuggle it to the bottom again. However, we were more circumspect regarding our sabotage after that.

After a typical day's diving, we would gather in the hold spaces of our living barge and divide up the spoils like a group of pirates. Each diver had his own hiding spot on the barge, and we developed emergency plans for disposing of the silver in the event of a search.

The Japanese imposed no restrictions on our movements on

Corregidor, and we were able to go into the various tunnels which had been used for beach defense units. Many of the tunnels were on remote parts of the island, and the Japanese were not aware of their existence. Slim, Jughead, Moe and I spent many hours after our diving was over going through various tunnels where supplies had been stored. Among other items, we were able to bring back muriatic acid and an electric grinder and wirebrush to our living barge for the purpose of cleaning the silver. We were able to get some of the silver to the remaining Americans on Corregidor, and they showed their gratitude by denying that they had received it from us when the Japanese found some in their possession. When the Japanese asked why it was blackened, the Americans replied that they had buried it before the surrender.

It seems strange to document that the Japanese set up a small store to sell peanuts and peppers to the prisoners in order to recover the silver pesos in circulation. This unusual effort to reclaim the silver brought to our attention the fact that the value of the Japanese invasion currency was diminishing with the appearance of the pesos. We then began to funnel larger quantities of the silver through our Filipino helpers, and it gave us a satisfying feeling of still being a part of the war effort.

Word was passed to us that one of the Americans at the hospital on Corregidor had a Hallicrafter radio that he wanted to sell us for \$300. Slim, Moe and I delivered the necessary money and smuggled the radio back to our living barge. We locked the radio in the box in the daytime and at night rigged it with an aerial to pick up "Voice of America," a broadcast on current war news. Night after night our small group gathered together, kept the radio volume down, and listened to the war news. We presumed that we would suffer some sort of punishment if we were discovered, but the uplifting effect of being able to follow the war progress made us throw caution to the wind.

Unfortunately, our new found recreation of listening to the war news came to a sudden halt! Some Japanese fishing boats tied up at our same dock, and the fishermen would come aboard our casco without invitation. We had located an old set of field telephones in one of the abandoned tunnels, and rigged up a hot wire which could be energized by turning the phone handle. We wired the favorite roosting place of our uninvited guests. When one would sit down on our entrance hatch, one of us would sneak behind the door and crank the handle. Along with providing us hilarious entertainment, this created some animosity.

A frequent guest was a young fisherman we nicknamed "Double Ugly." He showed up one day after the shock treatment, and indicated by a vigorous scratching pantomime in the genital area that he had contracted body crabs. He wished to know if we could provide some medicine for the condition, and Moe graciously handed him a bottle of iodine. We could never be absolutely certain that he was the one who revealed our secret, but he certainly had a motive.

Not long after the "iodine" incident, we were just getting ready to rig our makeshift aerial for the evening broadcast when a jeep pulled to a stop on the dock, and a squad of soldiers led by an Army officer with an interpreter, unceremoniously came on board. The officer asked just one question . . . "Where is the radio?" We felt very fortunate when he departed with our radio and the Army squad. Our belief, which appeared to be confirmed by the actions of the Japanese military on Corregidor, was that their orders were to not bother us as long as we cooperated with the silver salvage. ➤

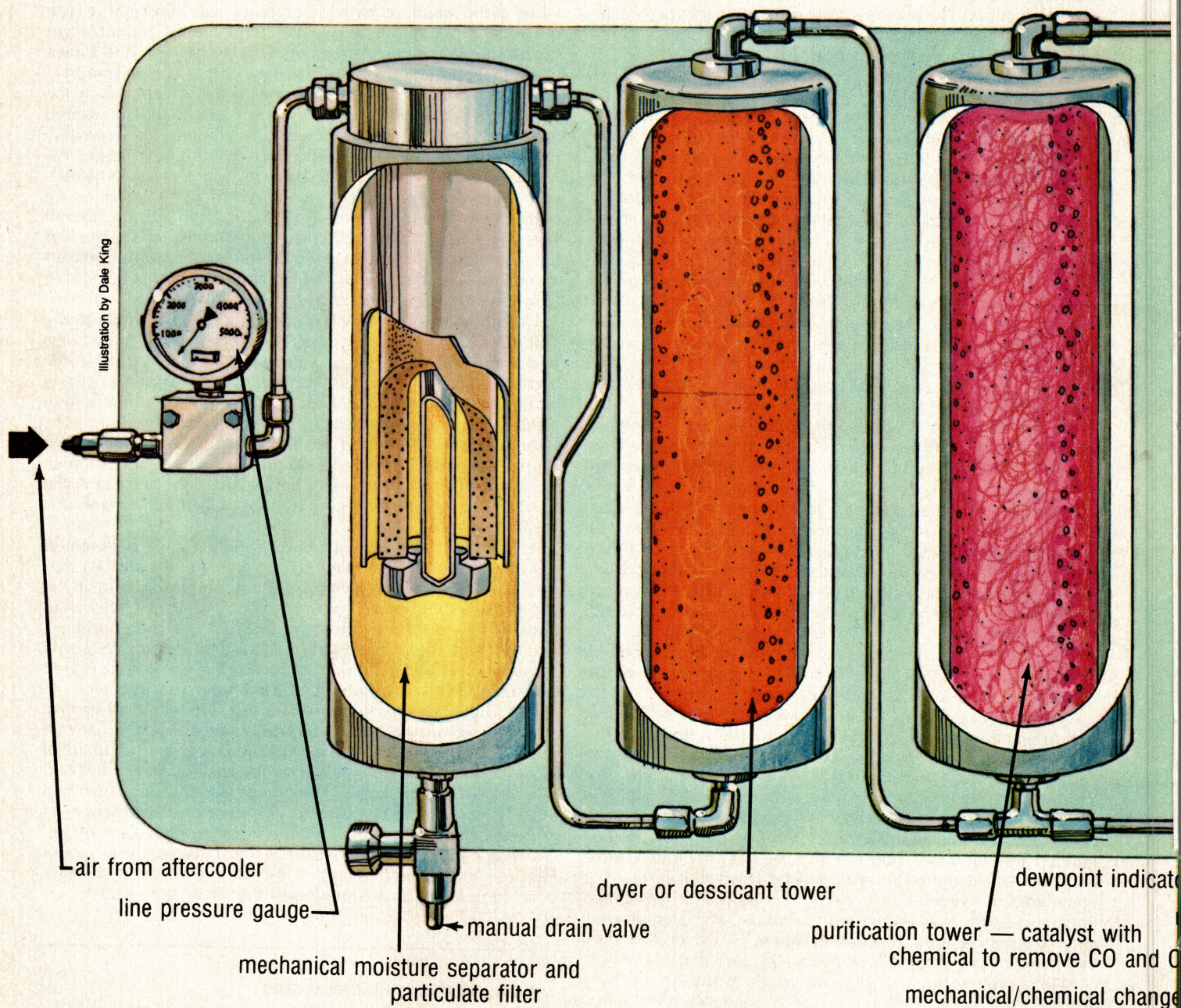
STAND BY FOR THE APRIL ISSUE!

In next month's SKIN DIVER, Bob Sheats and his diving buddies have some fun and sink a boat as they continue to sabotage the silver salvage operation.

WHAT EVERY DIVER SHOULD KNOW

ABOUT CO

LARGE VOLUME PURIFICATION SYSTEM

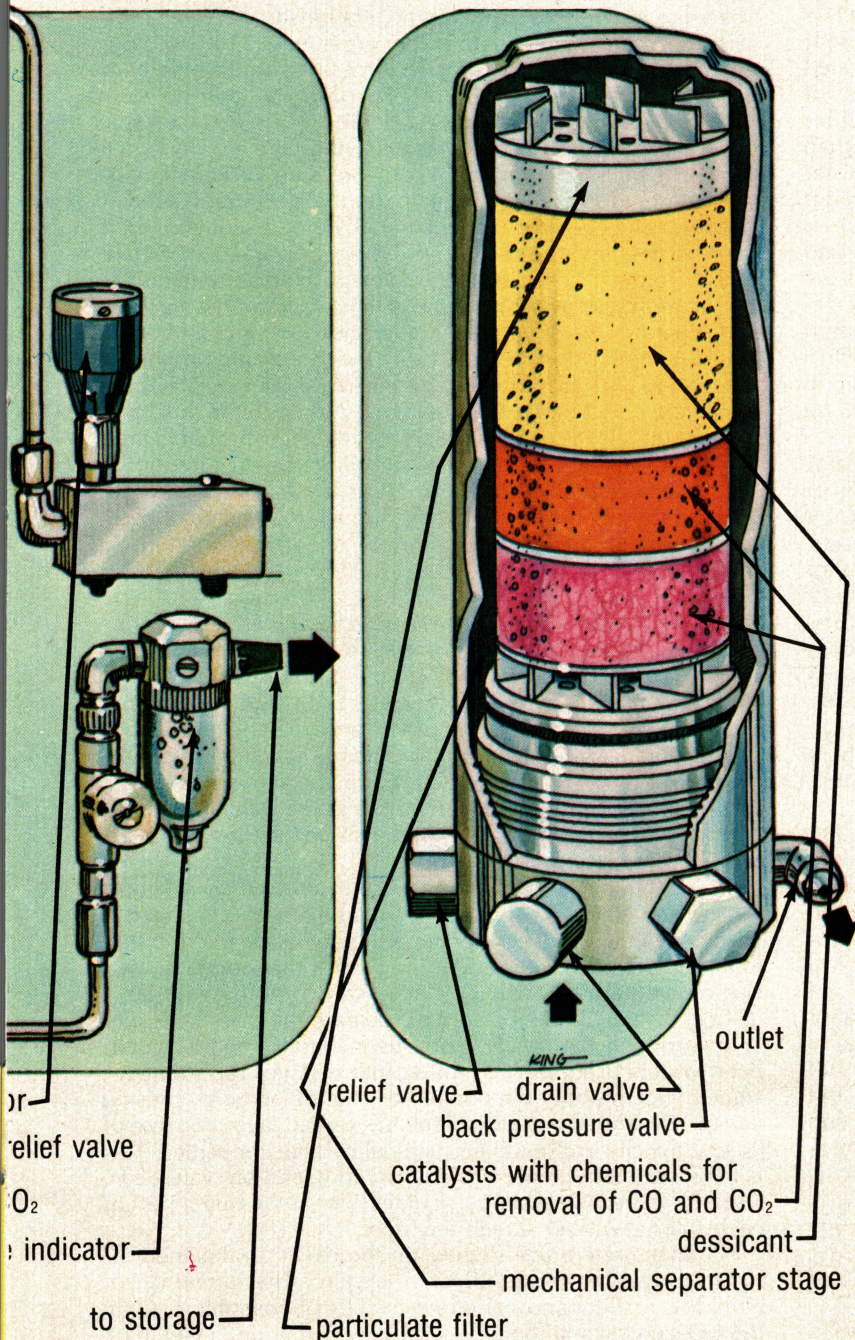


MPRESSORS

Air Purification

By Jim Hall

SMALL VOLUME PURIFICATION SYSTEM



Divers are demanding beasts and not only about the equipment they use: The air they breathe would make Mother Nature ashamed of her Rocky Mountain breezes. Before it is good enough to be used by a diver, it has been filtered, heated, spun dry and chemically treated until it is pure and safe for use underwater.

Bad air for divers is an almost unheard of problem in the United States. Compressors pumping air for human use are severely regulated by a myriad of state, federal and local laws all of which specify that what goes into your tank must exceed in quality the freshest air in nature. Yet it is possible to get a tank of bad air, whether it be a toxic contaminant or unpleasant odor. For his own protection, every diver should be alert to bad air conditions and familiar with the fundamentals of air purification.

The traveling diver should be especially wary of conditions that indicate the potential for pumping bad air. If you can, get a look at the general condition of the compressor — is it located in a dry, cool area with at least four clear feet of space on all sides? Is it clean, or is it covered with grease and dust? Lack of proper ventilation surrounding a compressor, and filth, can cause it to overheat beyond the system's cooling capability and the hot air will rapidly use up the chemical filters. When purchasing air from a gasoline-powered compressor be certain the compressor intake is located well away from the engine's exhaust.

Your first line of defense against bad air is that remarkable appendage known as your nose. If you weren't so overwhelmed with the odors of modern civilization, you would be surprised to learn that your sense of smell is about as developed as any predator in the forest. As a defense mechanism it can warn you of remarkably small quantities of airborne hazards. This writer knows a number of well-traveled divers who saved themselves from grief by taking a few hits off of their tanks prior to hitting the water — they were able to smell a breakdown in the local jungle compressor before it caught them on their dive. The most common problem comes from water contaminating the filter beds. The taste of activated alumina has been described as sour, rotten wine. Oil, of course, tastes and smells as you would expect it to, however, any strange tastes or smells should warn you of the presence of pollutants.

If you have any doubt about the air you have just obtained, try the old handkerchief trick. Take a clean, white handkerchief and hold it over the filler yoke of the air station that filled

your tanks. Run the air from the compressor's storage system through the handkerchief for at least 30 seconds and then examine it for any residue. *Remember: the presence of detectable contaminants is a good indication that undetectable contaminants may also be present.* Don't settle for any excuse such as "that's just dust from the filter system." Dust can reduce your regulator's efficiency by more than 50 percent and that margin of efficiency may make the difference between life and death in an emergency situation.

Odorless and tasteless contaminants such as carbon monoxide can bypass our organic warning system. CO and other gases such as carbon dioxide and methane work directly in the blood stream and are harder to detect prior to the onset of symptoms. CO₂ poisoning is most likely caused by improper breathing, however, headache, confusion and loss of consciousness could be caused by the increased partial pressure of the gas in a tank filled from a compressor whose final catalytic converter is inoperative.

Carbon monoxide and methane work in our blood by replacing the oxygen in our cells. Methane poisoning is virtually unheard of, but CO poisoning is not. CO can enter your breathing supply from the exhaust of a gasoline-operated compressor or by locating the intake near a parking lot or intersection with a lot of automobile traffic. Since it combines with the hemoglobin in our blood 200 times more readily than oxygen, a concentration of .001 atmosphere of CO will replace half the oxygen in our blood when breathed under pressure. CO poisoning expresses itself as a tightening across the forehead, a pounding headache around the temples and bright red fingernail beds and lips. Even more insidious is the fact that when diving deep the partial pressure of the oxygen in your tank may be great enough to ward off any symptoms until you begin to surface. As you begin to rise, the initial pressure of the oxygen which has forcibly displaced the CO in your blood plasma diminishes and the full effect of the poisoning will be felt instantly.

Since contaminants can enter our air supply from natural sources as well as from the compression process, some form of purification is absolutely necessary before it can be used by divers. Purification is the second step of the compression process and for our purposes can be defined as the removal of all harmful matter to established levels. Anything less is not purification. To achieve the desired quality levels for divers, air must be cooled, have the oil and water mechanically separated and pass through devices that will further remove moisture, adsorb underpressure oil vapor and odors, catalytically convert carbon monoxide to carbon dioxide and then scrub the carbon dioxide from the breathing mixture. The whole process of purification is a fine balance of compressor temperature, moisture, pressure and chemical action.

As your air is compressed it becomes hot — almost 300 degrees Fahrenheit at the final stage and 100 percent saturated with water vapor. If the compressor is oil-lubricated, your air also contained oil vapor. This oil and water vapor would rapidly destroy the chemical purifiers if allowed to pass downstream, so most good compressors route the air through a mechanical separator.

The mechanical phase of air purification is very important as it prepares the air for chemical purification. If properly treated during this phase, filter life can be extended up to 100 times. Not only is the oil and water removed at this point, but the air is also cooled to the optimum temperature of between 65 and 85 degrees Fahrenheit. This cooling aids the condensation process and makes certain that the downstream chemicals will work at maximum capacity.

A mechanical separator is designed to make the air change direction as many times as possible before it enters the chemical filter beds. This change of direction causes the oil and water vapor to coalesce onto the separator mechanism. Picture in your mind a tube filled with marbles. As the air flows in and around the marbles to reach the chemical purifiers, it

cools and deposits oil and water on their surfaces. The wastes can then flow off and accumulate in a sump at the bottom.

Now take the picture in your mind and reduce it to cup-shaped sintered bronze screens (like on the first stage of your regulator, but much thicker), porous stones of the same shape, or metal baffles and you have an idea of what is inside the mechanical separator. In actuality what you pictured as marbles happens on an almost microscopic level. Cooling is accomplished by passing the air through finned tubes near a fan, submerged coils in water or refrigerated lines. American Bristol has patented a unique method of spinning the air within their filters that causes the oil and water to fly to the sides of the filter housing and run down into the sump like raindrops on a window. At the bottom of all mechanical separators is a bleed valve which allows the compressor operator to frequently bleed off accumulated wastes.

Pressure here is a very important factor. By maintaining a high pressure during this phase, the air molecules are forced together and have less room to carry vaporized oil and water. There is a logarithmic scale for the relationship between pressure and vapor content with a filter pressure of 1700 psi being the best balance between the two forces. Maximum efficiency is somewhere around 3000 psi, however the gain between 1700 and 3000 is slight and may not justify the extra wear on the compressor. The actual pressure within the filter system is set by the manufacturer and a back pressure valve is located after the final filter stage to maintain the pressure desired.

After being cooled and mechanically processed, your air is ready to pass into the adsorptive purification and dehydration phase. To the casual observer, the exterior appearance of the purification system is confusing. In most systems, the mechanical separator is a separate cylinder, however any number of cylinders may follow depending on the design and purpose of the system. All are arranged in a vertical format, partly for appearance and partly for efficiency. Although the mechanical separator is the only part of the system that absolutely must be vertical so that condensed oil and water can accumulate in the sump, a vertical design utilizes the physical fact that warm air rises to help distribute the air through the chemical beds. Air flowing through a long, narrow horizontal tube would not encounter as much chemical surface as it would if that tube were vertical.

The surface area of the chemical bed and flow rate through the canisters also dictate some design configuration requirements. For maximum efficiency, your air must be exposed to the chemicals for as long as possible. Each manufacturer has balanced the rate of flow and diameter of the chemical canisters so that the ultimate product is nearly identical in quality despite the outward appearance. Again, the temperature of the air, the pressure of the filter system and the efficiency of the mechanical phase interrelate to determine the flow rate of the purification system.

No matter the exterior configuration of your dive shop's filter system, there are some basic things that are unchanged in all of them. Some use separate cylinders, each filled with a different chemical, others use long tubes that combine one, two or even all the chemicals necessary to purify your air.

If combined, it is necessary to separate the chemicals into layers through the use of a porous material. Spun glass has been widely used, but has fallen into disfavor recently over some concern about the possibility of glass particles causing cancer. Expanded polypropylene has gained favor because of its low toxicity and excellent particulate filter properties. This is the same material used as an insulating pad on waterbeds. Usually, there is another particulate filter at the outlet port of each filter to further screen any dust.

Manufacturers differ slightly on the exact arrangement of the chemicals in the purification system. The difference of emphasis is slight and sometimes mostly philosophical. Only the CO catalyst and the CO₂ scrubbing compound need to be in order for proper functioning. To simplify the process for

you, the following arrangement of purification appears to be the most favored:

Dehydration and adsorption. After leaving the mechanical separator your air is still not dry enough to pass through the purification system without seriously limiting its life. A variety of chemicals has been used at this point to further remove oil and water vapor. Silica gel and activated alumina were once popular, however, they have been abandoned in favor of a group of substances known as molecular sieves.

A molecular sieve is a compound that has an extremely large surface area that enhances its capacity for adsorption. Since it removes harmful contaminants by causing them to adhere to its surface, it remains inert and virtually physically unchanged during the purification process. The most popular molecular sieve used today is a form of expanded alumina silicate known as Linde 13X.

Linde 13X is a truly remarkable substance which is light beige and resembles small granules quite like the sprinkles you sometimes get on decorated doughnuts. Linde 13X can handle gases up to 235 degrees and has a great capability to remove oil as well as water vapor. These granules are filled with holes whose size can only be expressed in angstroms (an angstrom is one ten-billionth of a meter). These small holes create an incredible surface area of 2,000,000 square feet per pound of molecular sieve! It is on this surface that most of the water and oil becomes trapped.

Activated Carbon. Your air now passes over, around and through the oldest and most universal filtering medium in use — activated carbon. Activated carbon is so efficient as a purifier that it alone has the ability to remove most contaminants in your air supply. However, if used alone it has a very short life and must be monitored constantly. Activated carbon is used to remove any final traces of hydrocarbons and all obnoxious odors that remain after treatment by the molecular sieve. Because of its superior activity and low dust content, only coconut shell charcoal should be used.

Catalytic conversion. This is a two-step process. First, your air passes through a bed of black granular substance known as Hopcalite. Widely used for years in gas masks, Hopcalite converts any remaining carbon monoxide into carbon dioxide. Next, your air passes into a bed of soda sorb which scrubs it of any CO₂ created in the previous process. Soda sorb has replaced caustic soda because it does not form caustic compounds when wet.

Throughout the filtration and purification process, there are a variety of devices to monitor and alert the compressor owner to the status of his filtration system. Most important are the dewpoint indicator which measures the moisture content of the air and the carbon monoxide indicator. Both devices are electronic and can be preset to known levels of tolerance. When either the moisture or CO content of the air surpasses those levels, an alarm is sounded and the compressor shuts down. Of course, it would be fallacious to believe that these automatic controls are all that is needed to monitor the quality of air in a compressor system. The presence or absence of a device does not guarantee that the air pumped will always meet standards for human use. The trend of pure-air legislation in such states as Maine and California as well as on the federal level has created a need for regular air analysis of every dive shop's air. Hopefully, through voluntary participation in analysis services, such as the PADI Pure Air Program and other private companies, dive shop owners will demonstrate their willingness to protect our lives and stem further legislation.

Next, we will look into what appears to be the simplest part of the compressor system — the storage vessels and the filler station. There is a bewildering array of laws surrounding what you may and may not do to store air for personal use. The trend is on to higher pressure and we will examine how to pump to 6000 psi and what dangers may or may not be lurking in the construction of your filling station. ➤

How to sound like the experts and still know what you are saying: a glossary of terms used in air purification:

PURIFICATION: The removal of all harmful matter.

ABSORPTION: The diffusion into the absorbing material of a gas or liquid. The material will usually increase in size proportionately.

ADSORPTION: The process of condensation on the surface and interior cavities of a material. The preferred method of contaminant removal; the adsorbing material will change little in appearance except to gain weight.

CATALYST: A substance which causes a chemical change in another substance.

CONTAMINANT: Any substance which might be harmful.

DEHYDRATION: The removal of water and water vapor.

DEWPOINT: The temperature, at atmospheric pressure, at which air is saturated with moisture and the water vapor begins to deposit as a liquid.

FILTRATION: Strictly speaking, the removal of solid particles by passing the carrying medium through a porous article.

HYDROCARBON: An organic compound comprised of hydrogen and carbon.

MICRON: A unit of measurement used to rate filters. One micron equals .00004 of an inch.

MANUFACTURERS OF AIR PURIFICATION SYSTEMS

American Bristol Industries
25032 Broadwell Avenue
Harbor City, Calif. 90710

Mako Products
3131 N.E. 188th Street
Miami, Florida 33160

Aqua-Air Industries
221 Bark Drive
Harvey, Louisiana 70059

McWhorter Engineering Company
P.O. Box 9014
Birmingham, Alabama 35213

Aqua Products
4110 Secor Road
Toledo, Ohio 43623

RIX Industries
6448 Bay Street
Emeryville, Calif. 94608

Deltech Engineering
Century Park
New Castle, Delaware 19720

Robbins Aviation, Inc.
3817 Santa Fe Avenue
Vernon, Calif. 90058

Desco
212 N. Broadway
Milwaukee, Wisconsin 53202

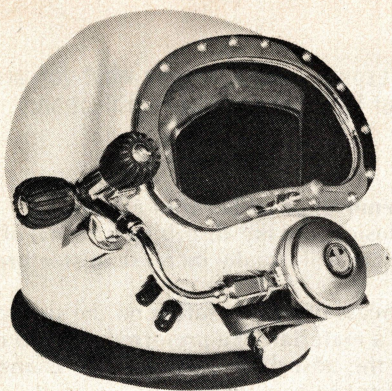
Subsea Air Systems
3816 Cheasty Blvd. South
Seattle, Washington 98108

Divers Exchange Inc.
2245 Breaux Avenue
P.O. Box 504
Harvey, Louisiana 70058

Trident Systems, Inc.
325 Hickory Avenue
Merritt Island, Florida 32952

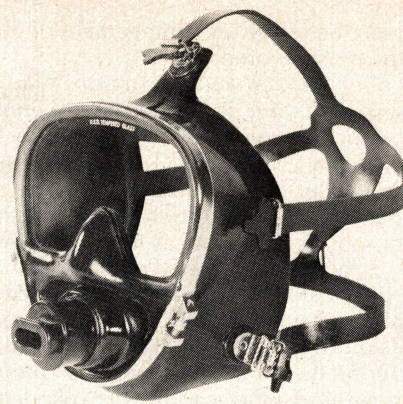
Innerspace Research
4780 East 11th Avenue
Hialeah, Florida 33013

Walter Kidde & Company, Inc.
675 Main Street
Belville, N.J. 07109



The COM HAT-1.

COMDIVE



The Mark I Professional Mask.

U.S. Divers Booming Commercial Diving Division

By Edward C. Cargile

Question: Who has over 25 years experience in the development and manufacture of dive equipment? What company has its dive equipment in use by commercial, military and scientific divers around the world? Who has the goal of becoming the supermart of commercial dive equipment?

Answer: U.S. Divers Co. A little publicized aspect of the company is the Commercial Diving Division.

U.S. Divers is by far the largest manufacturer and distributor of dive equipment in the world, and has over 450 employees. But growth to this impressive size did not happen overnight.

In early 1942 Jacques Cousteau, then a French Naval Officer, and engineer Emile Gagnan developed the fully automatic Aqua-Lung® regulator. During the summer of 1943 Cousteau tested it in the Mediterranean Sea under very

dangerous conditions in German and Italian occupied France. The new regulator opened vast new undersea frontiers and gave the diver more freedom from the surface than ever before. The Cousteau team used the Aqua-Lung® to explore the ocean and share their experiences through books and underwater photography.

After World War II, Cousteau recognized the need for help to manufacture



photograph by Author

and sell the Aqua-Lung® dive system. The patent rights for the regulator were sold to L'Air Liquide of France at that time. It became the nucleus of a new division of the company, La Spirotechnique in Paris.

Production and distribution was begun in Europe. In 1948 a license agreement was made with Canadian Liquid Air, located near Montreal, to manufacture the Aqua-Lung® regulator in North America. L'Air Liquide later purchased Canadian Liquid Air.

Also in 1948, Pierre Salbaing of La Spirotechnique demonstrated the Aqua-Lung® to the U.S. Navy.

Rene Bussoz, owner of Rene's Sporting Goods in Los Angeles, began importing the Aqua-Lung® into the United States for sale in 1949. For further

the Board, a position he still holds today. La Spirotechnique owned 95 percent of U.S. Divers and Cousteau, 5 percent.

The parent company, L'Air Liquide, now owned five dive equipment and operation companies: La Spirotechnique in France, U.S. Divers in the United States, Techna Sub in Genoa, Italy, Australian Divers in Australia, and Nihon Aqua-Lung in Japan. L'Air Liquide also owned Canadian Liquid Air.

Rapid growth of U.S. Divers required larger facilities. So, in March, 1960, the company moved to their present 94,000 square foot facility in Santa Ana, California, about 30 miles south of Los Angeles. The following year the company formed the SurvivAir Division.

The U.S. Divers' non-magnetic, single hose regulator received U.S. Navy ap-

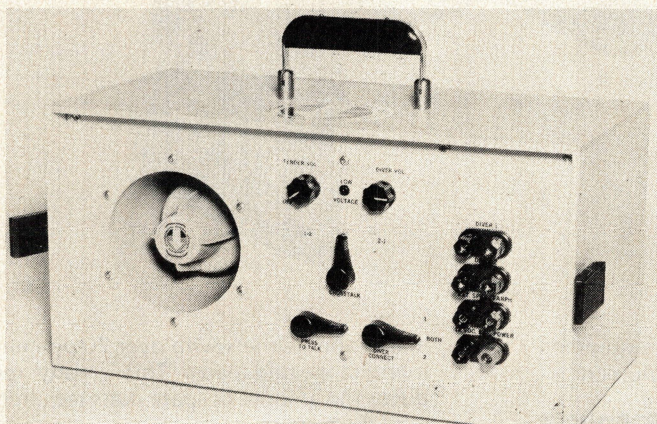
proval in 1966. The company has supplied all non-magnetic military dive equipment under government contract since the introduction of the first scuba system, Aqua-Lung®. Non-magnetic dive equipment is required when divers are working around mines and other underwater explosives, and to reduce detection by sonar for clandestine dives.

Further growth was made possible in 1967 when the Shamrock Rubber and Life Support Systems Divisions were formed. Other commercial dive equipment was continually added to the products by the company. A full face mask for use with the two hose demand regulator was offered in 1967.

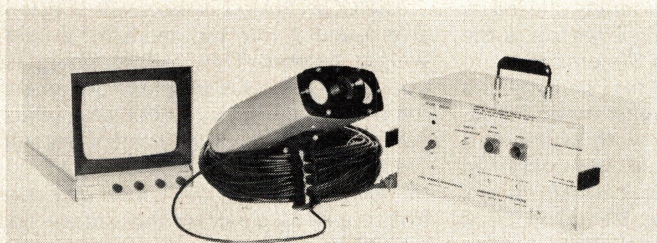
The Life Support Division of U.S. Divers was also formed in 1967. A Hyperbaric Chamber Complex was installed for testing life support equipment. One of the contracts was to supply the solid state oxygen generation system for the U.S. Air Force C5 cargo jet aircraft. The Chamber Complex also supported the U.S. Navy Deep Submergence Rescue Vehicle (DSRV) life support system development work.

U.S. Divers began development in 1967 of the carbon dioxide removal system for the deep submersible *BEAVER IV* for North American Rockwell Corp. (now Rockwell International).

In 1969, U.S. Divers Co. formed the Commercial Diving Division to provide even more support for this expanding aspect of diving. The company purchased the Kirby-Morgan Corporation of Santa Barbara, Calif. This increased the commercial product line to include the KMB-8 Band Mask and Safety Helmet,



U.S. Divers commercial dive products include: a diver umbilical (top r.) with life line, air hose, pneumo hose and communication wire, the Two-Diver Hardwire Communications System for communication between topside tender, two divers, and Model 350 U/W TV System (bottom l.).



growth, Bussoz formed U.S. Divers Co. in 1952. Early facilities were established in West Los Angeles. Several other types of dive equipment were added to the product line as the company increased its sales.

Throughout the growth of the company, commercial dive equipment has been an important part of the product line. As early as 1952 the company offered hookah compressors. And, the two hose regulator was used by many early commercial divers.

In 1953 the United States Navy officially sanctioned the Aqua-Lung® as standard dive equipment. Constant-volume suits were added to the commercial line in 1954.

La Spirotechnique purchased U.S. Divers Co. in 1957. That same year Jacques Cousteau was appointed Chairman of

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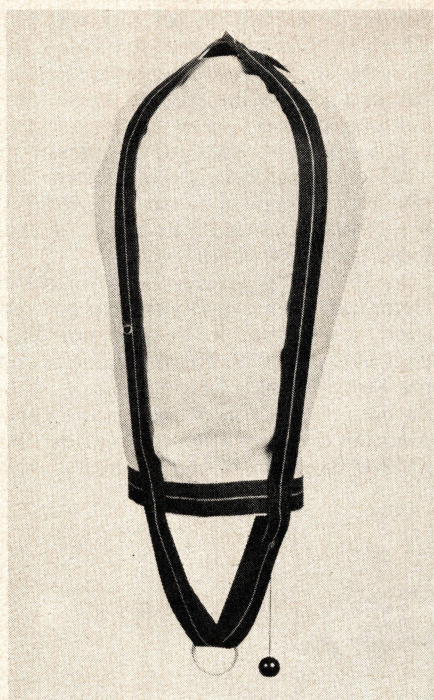
the Kirby-Morgan Air and Gas Diving Helmet, the Kirby-Morgan Clam Shell Diving Helmet, a Diver Communication System, plus other dive equipment.

That same year U.S. Divers Co. added the Yokohama Hard Hat Helmet and Diving Dress System.

In 1970 U.S. Divers was voted one of the Twenty Pacesetters in the Field of Oceanology, selected from a field of over 1000 corporations.

L'Air Liquide bought American Cyrogenics from Standard Oil of New Jersey (now Exxon) in a stock transfer between the two companies in 1972. The newly-acquired company was renamed Liquid Air of North America. Several other U.S. gas companies were purchased and put under the San Francisco-based Liquid Air of North America.

This acquisition program resulted in 85



Other U.S. Divers commercial dive products are lift bags such as the one above, and the KMB Band Mask Safety Helmet which is worn over Band Masks for protection.



percent ownership of U.S. Divers Co. by La Spirotechnique and 15 percent by Exxon, with Cousteaus' interest part of La Spirotechnique.

U.S. Divers has continued to grow and offer new equipment. And, even greater growth is planned for the future. John Cronin is President of U.S. Divers and has extensive experience in dive equipment sales. He also was one of the founders of the Professional Association of Diving Instructors (PADI).

Supporting the Commercial Diving Division, along with all the other company divisions, is the Engineering Department. Leon Cerniway is Vice President of Engineering. He is responsible for the design and development of new dive equipment, ensuring the maximum support during manufacturing for the best quality control possible, the Hyperbaric Chamber Complex, Testing Laboratory, plus other engineering functions.

Heading the Commercial Diving Division as Manager is Tom Cetta, who came to U.S. Divers last year with a strong engineering and dive background. Before the appointment to the position of Manager, Tom was a Research and Test Engineer with the Navy Experimental Diving Unit for six years. He is a qualified Navy Air and Mixed Gas Deep Sea Diver, is trained as a Navy Saturation Diver and graduated from the Navy Underwater Swimmers School. Tom is responsible for the entire commercial dive equipment

line, developing new equipment, sales and service of the equipment.

COMMERCIAL DIVE PRODUCTS

One of the newest products offered by the Commercial Diving Division is the Model 350 Television System. This underwater television system consists of a small, rugged, highly-sensitive underwater television camera with water corrected contact optics and self-contained lighting mounted in a cast aluminum housing, underwater cable up to 2000 feet long, a surface monitor, and video recording capabilities.

Options for the 350 Television System include either hand-held or helmet-mounted models, video tape recorder, extremely sensitive camera tubes, several camera/port/lens/lighting configurations, power, and umbilical cable selections. The completely solid-state electronics in the system is operated from the surface by a single power on/off switch.

The new underwater television system is designed for underwater inspection, observation, data logging, use with undersea research vehicles, diving bell systems, underwater habitats, dive medical research, plus many other applications. The price of the Model 350 Television System is much lower than most other underwater television systems available.

Several breathing systems are offered by the company. Considerable effort has gone into making the different dive

masks and helmets with over 70 percent interchangeable parts. This greatly reduces the amount of spare parts required to make repairs.

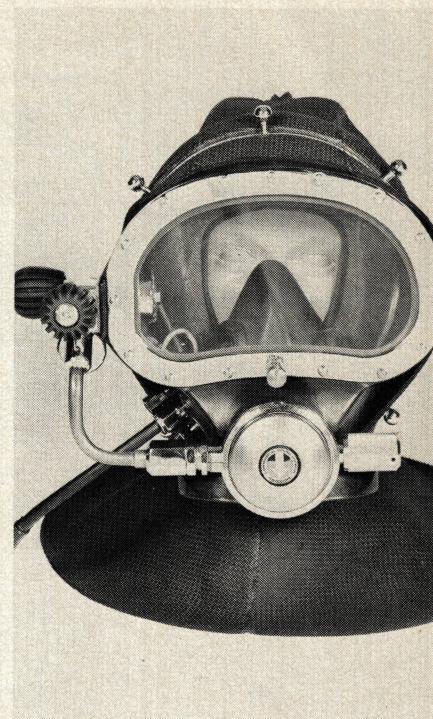
The COM HAT-1 is the result of extensive research into the needs for a lightweight helmet. This yellow fiberglass one-piece helmet is simple to put on and remove, attaching to a neck seal which can be worn with either a wet or dry suit. On the right side of the COM HAT-1 is the gas supply manifold, with one control supplying gas from the surface and the other valve to route gas from the emergency gas tank on the diver's back.

The adjustable second stage regulator mounted on the HAT front has a purge button and exhaust valves below. The COM HAT-1 is equipped with an oral-nasal mask, nose/ear clearing device, communications, and gas routing to keep the faceplate unfogged.

The COM HAT-1 can be used for air or mixed gas down to 1600 feet. It has a 90 percent part interchangeability with the KMB-10 Band Mask.

The COM MASK-1 is an open circuit, constant volume, yellow fiberglass full face mask held comfortably on by a zippered neoprene hood and securing straps. An oral-nasal mask and communication microphone/speaker are mounted inside the COM MASK-1.

The KMB-10 Band Mask is a very comfortable full face mask with an attached zippered neoprene hood and mask se-



Above are three U.S. Divers commercial diver masks. The KMB-10 Band Mask provides comfortable fit, adjustable air or mixed gas flow, emergency gas supply, communications, oral-nasal mask and wide, unfogged vision. The COM MASK-1 is an open-circuit, constant volume, full face mask. The USN MK-1 MOD-O Mask is used by the U.S. Navy for diving bell operations and other diving.

curing strap. The mask is built around a contoured red fiberglass frame. The side manifold is mounted on the right side, with controls for freeflow and the emergency gas supply valve, plus a U.S. Divers developed non-return valve.

A 3/8 inch, inside-diameter, chrome-metal tube routes the breathing gas from the first stage regulator to the adjustable second stage regulator located on the lower front of the mask.

The wide faceplate provides excellent vision. An oral-nasal mask is mounted on the inside with a built-in nose/ear equalizing device and communication microphone. A communication ear phone is on the left side of the mask.

The USN MK-1 MOD-O Divers' Mask has been approved for use by the United States Navy. It is the same full face mask as the KMB-10, with the following differences: The tube from the first stage to the second stage is unchromed and black, a Kempner non-return valve is used in the gas manifold block, the emergency control valve is 3/16 inch ID, and the mask frame is black.

The Two-Diver Hardwire Communications System provides communication with two divers using air and the surface through communication wire which is part of the diver breathing umbilical. The Communications System is built with ocean air and rugged treatment in mind.

Lift Bags are also available in three sizes: 100 lbs., 250 lbs., and 450 lbs.

They are made of neoprene sandwiched between nylon. This provides a lightweight sturdy bag that will not tear or dry out and crack, providing years of watertight lift capabilities. All seams are double heat sealed.

Webbing straps going over the entire length of the bags ensure maximum strength. A vent valve on the top of the bag is controllable from the bottom.

RESEARCH AND TESTING FACILITY

U.S. Divers is justifiably proud of the Research and Testing Facility, one of the largest and most complete of the dive equipment manufacturers.

The facility contains a complete Hyperbaric Chamber Complex, made up of a large cylinder chamber connected to a sphere. The double lock chamber can be pressurized to 1200 feet and the sphere is capable of pressures down to 1635 feet. The complex is equipped with a medical lock, penetrators for instrumentation, pressure transducers, plus O₂ and CO₂ analyzers. A complete external control console allows multiple chamber configuration usage, control and monitoring.

A wide range breathing machine can be placed in the Hyperbaric Chamber Complex to test regulators, full face masks and helmets at different simulated diving depths. Full instrumentation allows external electronic plotting of the equipment test results on X-Y plotters or

strip chart recorders.

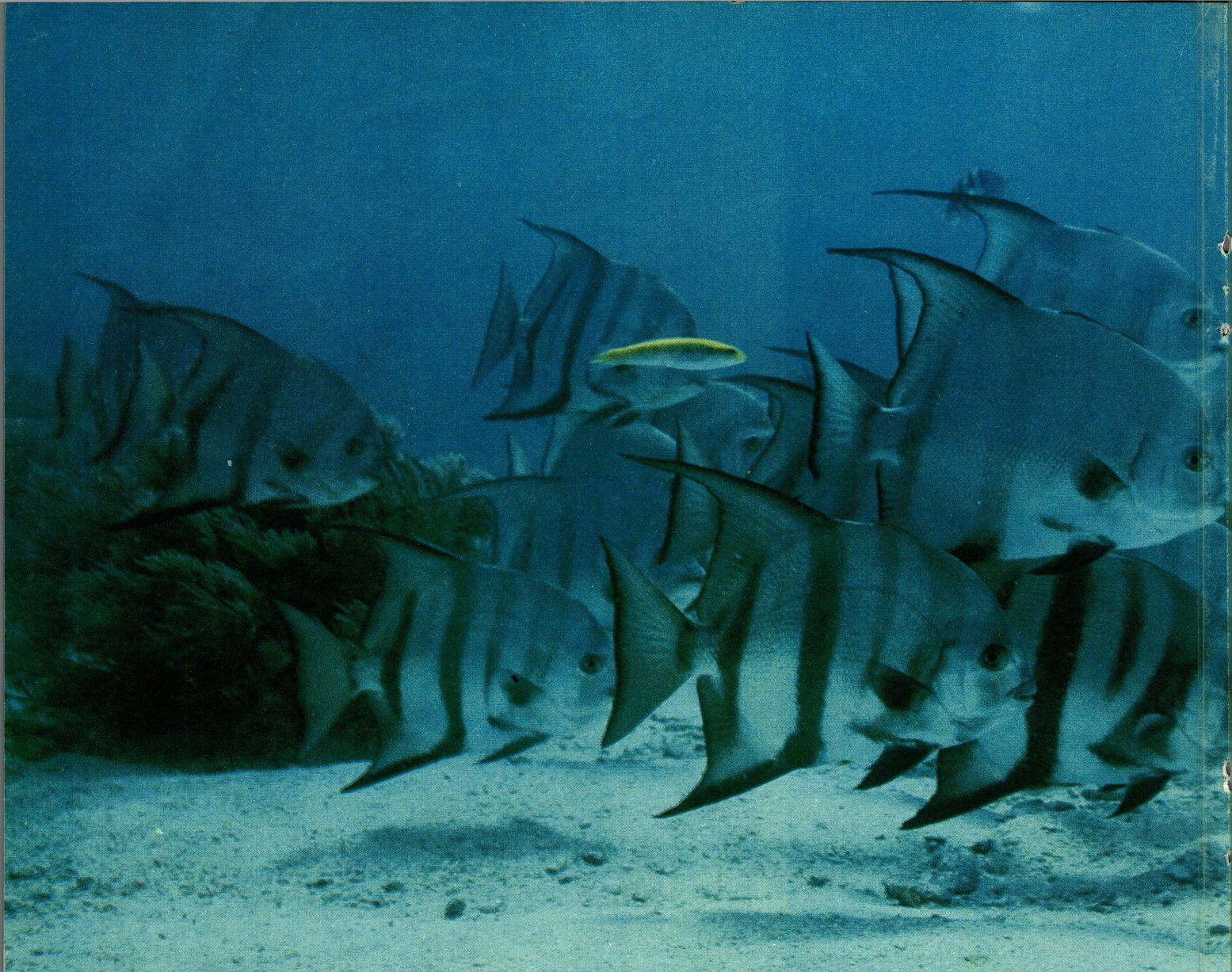
The Research and Testing Facility is used in a cooperative program with several sport dive equipment manufacturers as part of the efforts by the Diving Equipment Manufacturers Association (DEMA) to establish and maintain safe equipment standards. Work on several government and university research and development projects are in various phases of development. Any organization desiring to utilize the facility can make arrangements through the Vice President of Engineering.

COMMERCIAL DIVING DIVISION

The future of this division of U.S. Divers Co. will have even greater growth than in the past. Research is now in progress on new commercial dive equipment. Servicing of the equipment in the field will continue to expand. The monitoring and feedback from commercial, military and scientific divers will increase to provide what is needed.

All of this requires personnel, facilities, special equipment, time and money. But U.S. Divers is committed to supply all the equipment needs for the professional diver.

If you would like more information, have specific questions, or would like to see some of the equipment, contact Tom Cetta, Manager, Commercial Diving Division, U.S. Divers Co., 3323 W. Warner Ave., Santa Ana, Calif. 92702.



ft. lauderdale's re

a florida surprise package

So much has been written about the mangrove-fringed islands and spectacular coral reefs of the Florida Keys that, for most people, a dive vacation in Florida is synonymous with the Keys. Consequently, out-of-state divers usually drive non-stop straight through the state without realizing they are passing some terrific underwater spots along the way.

The reputation of the Keys as a diver's dreamland is well justified and few people are disappointed. The islands are one of the natural wonders of the world and a big part of their attractiveness is an emotional experience that cannot be described. However, the peninsula of Florida offers 6000 miles of coastline with a great variety of underwater terrain and a wider diversity of marine life than any comparable area in the world.

Old-time Florida divers know this and most of them dive other areas far more often than they do the Keys. But they don't talk much about these other spots and few tourist divers even know they exist. As a result, some of the reefs off Florida are dived so seldom they are almost virgin, and the fish are curious and unafraid of humans.

One such area is Ft. Lauderdale and the divers who stop off here on their way to the Keys are due for some pleasant



efs

By Bill Barada

photography by Jim Ward



surprises. There are three distinct reef lines, or ledges, off this area of the coast and each has its own peculiar biological community that is different from the others. Technically they may all be an extension of the same reef, but so far as local divers are concerned they are separate areas and are known as the first, second and third reefs.

The reefs run more or less parallel to shore and are somewhat similar to the ledges and outcroppings found offshore along the entire Atlantic coast of Florida. In the northern part of the state these are rocky ledges that were once the shoreline of ancient seas and were probably formed by tube worms. Off Ft. Lauderdale, however, the ledges are a combination of rocky outcroppings and living coral reefs and divers have the advantage of exploring deep undercut slots and caves, plus the beauty and diversity of marine life associated with living corals.

That is the first Ft. Lauderdale surprise. Most divers think of living coral reefs as only off Caribbean islands or the Florida Keys. But, as Barbara McCallister, Cruise Coordinator for Adventure Cruises based in Ft. Lauderdale, says, "We have staghorn, elkhorn, brain, pillar, lettuce, star; all

plumage of seafans, seawhips, and seafeathers soften the face of sheer rocky ledges and form a waving forest that covers the flats. Mixed with these are small clusters and clumps of elkhorn, brain and pillar corals that, in some ways, are more strikingly beautiful than the vast expanses of corals found in Caribbean waters. Their attraction is somewhat like the startling beauty of a desert oasis as compared to the overwhelming greenery of a massive forest. The contrast to their surroundings make each separate group of corals stand out like a cluster of roses in a garden of ferns.

The second surprise offered by Ft. Lauderdale is good diving within easy swimming distance from a sandy beach. Unlike Miami Beach and similar coastal cities where high-rise hotels and condominiums form a solid wall of concrete that blocks access to the ocean — Ft. Lauderdale's beaches are reserved for public use. A city ordinance prohibits the location of any type of building between Hwy. A-1-A and the ocean. As a result the public has access to miles of white, sandy beaches studded with palm trees, picnic tables, restrooms, and plenty of parking space. The offshore

Once abundant, giant jewfish are now rarely seen. They are a slow-growing fish — a 150 pounder could be 150 years old.



photography by Author

species of corals. You name it, and Ft. Lauderdale reefs have it. Not the tremendous expanses of solid coral that you find in the Keys. Ours are in smaller, isolated clumps, but every bit as beautiful."

Barbara's description is accurate. I found a wide diversity of corals thriving on Ft. Lauderdale reefs. The graceful

reefs form a protective barrier which reduces wave action and helps to prevent beach erosion. The surf is usually so mild that ocean swimming is safe for children.

The first reef is only about 50 yards from the beach and the depth of water varies between 5 feet and 30 feet, depending upon the area. It is a living reef with ledges, crev-

ices, caves, and corals that is excellent for snorkeling. As with most shallow, inshore reefs, the majority of fish are juveniles of larger species. These combine with swarms of colorful tropicals that weave among the richly-hued sponges and corals to form a tapestry of moving color.

An indication of the attractiveness of this reef is that veteran Ft. Lauderdale divers find great satisfaction and enjoyment free-diving on the first reef. Also, Joe Shirk, owner of Diving Trips, Inc. and skipper of the *Scuba Too*; who goes underwater with dive groups on Ft. Lauderdale reefs every day of the week, says that the first reef is his favorite hunting ground for lobster. When lobster season opens, Joe tows customers along the top of the reef with a line from his boat. When a diver spots a lobster's feelers, he lets go of the line, the boat stops and everybody goes overboard to scour the bottom for more bugs. Sometimes they hit the jackpot and work the same area for a long time. If not, towing is resumed until more feelers are spotted.

The reef runs for miles along the coast so there is little likelihood of running out of good diving. But the good ledges start and stop and, as with most dive areas, it pays to know where the best spots are.

The second reef is farther offshore, about a mile in most places, and you need a boat to dive it unless you like long-distance swimming. The water is about 40 to 60 feet deep and the reef is characterized by high ledges that project 10 to 15 feet above the bottom. These are undercut by deep slots and crevices that abound with larger species of fish than are usually found on the inshore reef. This reef also has a jumble of coral heads and clusters of corals that grow in the flats away from the ledge, providing more hiding places for fish and other marine life. Nestled into the rocks and corals of the reef are brilliantly colored sponges and soft gorgonian corals, creating a beautiful blending of living color that only nature can produce.

This is the most popular reef for Ft. Lauderdale divers. The maximum depth of 60 feet allows plenty of bottom time without worrying about decompression and the marine life is abundant enough to satisfy almost anybody. Thick schools of spadefish, grunt, goatfish, yellowtail and similar reef fish are so tame they follow divers around and will often eat out of their hands. Huge blue parrotfish weave in and out among the seafans. Saucy queen angelfish preen themselves and pose in front of your camera. Grouper peer at you from inside their cave homes and snappers watch over you and check out your activities. The pencil-thin bodies of schools of baracuda form silvery clouds that hover above some sections of the reef and sea turtles are often found sleeping beneath an overhanging ledge.

Joe Shirk's most prized pet is a giant moray eel that lives in a cave on the second reef. He says it is by far the largest he has ever seen and Joe hesitates to estimate its length, but believes that it is at least 12 feet, perhaps 14 feet, long, and its body is more than 12 inches thick. The eel is so tame that Joe is tempted to try feeding it. Ft. Lauderdale divers are proud of this prized moray and if a spearfisherman shoots it he had best sneak quietly out of town before they find out.

The third reef is in 90 to 110 feet of water near the edge of the Gulf Stream. Strong currents are seldom encountered on the inner reefs but are commonplace on the deep-water reef. It has the highest ledges, 15 to 25 feet, with deep holes and caves, and bigger fish. However, the giant jewfish which were once abundant on Florida reefs are rarely encountered in any of the more popular dive sites anymore and Ft. Lauderdale is no exception. It is commonly believed that commercial fishermen and commercial divers (who hunt jewfish with powerheads and sell the meat for a nickel a pound) have either wiped out the populations of these huge fish, or have permanently driven them out of the area. This is one species of fish that fishermen can deplete. They grow so slowly that, according to some scientists, a 150

pound jewfish may be more than 150 years old.

At any rate, even though you are unlikely to see any jewfish, there are plenty of 20 to 30 pound grouper, large hog snappers, mutton snapper, and similar bottom-dwelling denizens to make a dive in this area exciting. Also, because these are Gulf Stream waters, fish such as cobia, wahoo, dolphin and even sailfish may flash past.

The corals and sponges on the third reef are also larger than those of the inner reefs and Barbara McCallister says the deep reef off Howard Johnson's motel is "loaded with spiny oysters." She claims this sea shell is abundant in this particular section and an expert at shell collecting should have no trouble finding prize-winning specimens.

Barbara is a "one-of-a-kind" shell collector who selects only species she doesn't already have, or a specimen that is superior to the one in her collection. She advises shell collectors who visit Ft. Lauderdale to work the flats between the reef ledges. She found the largest helmet shell she has ever seen in this area and says that queen conch and a number of exotic sea shells can be found by divers who know where and how to look for them.

Beyond the third reef the bottom slopes sharply down into great depths, but there are patch reefs and ledges that can be explored by those who like deep diving. Barbara says a black coral forest exists on this slope and some beautiful specimens have been taken. However, Gulf Stream currents are so strong that out-of-state divers are seldom, if ever, taken out to these reefs. The combination of deep diving and strong currents present hazards that are unfamiliar to most inland divers and you must make special arrangements and be able to prove your experience and competence before a Ft. Lauderdale dive boat will take you out to the third reef.

You won't find 150 to 200 foot visibility off Ft. Lauderdale as you do in the Bahamas and Caribbean islands. The turbid water from North Biscayne Bay and Miami flows northward and has some effect on Ft. Lauderdale water. But the Gulf Stream currents periodically wash the area clean and the average visibility in summer is more than 50 feet, with many days when you can see the bottom in 80 feet of water. On days when the stream sweeps close inshore you can see your diving buddy when he is 150 feet away, float on the surface and pick out ledges on the deep reef 100 feet below you, and spot lobster feelers on the second reef through 40 feet of water.

Like all diving areas, the visibility off Ft. Lauderdale is heavily dependent upon the weather. This is particularly true of shallow coastal waters which are stirred up by the turbulence of ocean waves and storms. For the same reason visibility varies from reef to reef. The more shallow the reef the more the sand is stirred up and the more turbid the water. Dave Inman, owner of Divers Unlimited, says you can count on being able to see twice as far on the second reef as on the first — and you can see twice as far on the third reef as on the second.

As with virtually all tropical dive areas, the best visibility and the warmest water is found during the summer months from June through October. The water temperature ranges between 94 and 97 degrees, gentle southerly winds keep the Atlantic smooth and calm, and visibility is usually good.

Winter diving can sometimes be very good but you are definitely gambling on the weather. The prevailing winter wind is onshore from the northeast and turbulence stirs up bottom sediments. The ocean is often too rough for comfortable diving and visibility on the shallow reef is so poor that diving is not fun for those who insist on clear water.

Everything is relative, however, and when Florida divers speak of "poor visibility" it is a good idea to remember that they also consider 70 degree water "cold." This often leads to confusion with out-of-state divers because a veteran Florida diver will usually recommend wet suits when water

temperatures drop below 80 degrees. To northern divers who are accustomed to 40 degree thermoclines in inland lakes, or 50 degree summer temperatures in the northern Atlantic or Pacific waters, 75 degrees is bathing-suit diving.

The same is true for visibility. Southern California divers working shallow coastal water from the beach consider 25 foot visibility as good, ten feet as satisfactory, and they often hunt lobster in water so dirty they can't see their own flippers. Clear water is also an unknown quality for most inland divers because visibility in the majority of our lakes is measured in inches rather than feet. Also, spearfishermen hunting striped bass off New York use a short gun and carry it next to their hip, because they can't see the tip when it is extended at arm's length.

The point of all this is that, when a Ft. Lauderdale diver tells you that the water is "cold and dirty" in winter, he means the temperature is 70 degrees and visibility is only 10 to 15 feet — conditions which would be considered excellent in most waters of the United States. Also, Florida's lobster season is open through the winter, and the best bug diving this writer has ever found was in water so dirty my hands disappeared when I held them out straight. So, if you are planning a winter dive vacation in Florida and are accustomed to turbid water, Ft. Lauderdale might be a good bet for you.

Ft. Lauderdale offers another advantage that should be of interest to many divers. It is a large, modern town with plenty of full-service dive shops which provide repairs, spare parts, and replacements for most major lines of equipment. It is also a great place to be when the weather really turns foul and diving is out of the question. This can happen any place you go, but in Ft. Lauderdale there are so many attractions on land that you probably won't mind being beached for a few days. Not only does it offer a wide selection of hotels, motels and trailer parks at reasonable rates — especially during the summer; it is also a big, friendly city that is popular with younger tourists because the businessmen depend upon repeat customers, and this is reflected in both prices and attitudes.

The choice of restaurants, night clubs and other entertainment ranges all the way from topflight, big-name spots that appeal to the champagne and caviar crowd — to low cost, inconspicuous places that cater to the beer and hamburger groups. The odds are great that it won't require much detective work to find the kind of places and entertainment that appeals to your particular tastes.

Equally important is that Ft. Lauderdale is a diver's town and you meet enthusiasts everywhere you go. The cocktail waitress, hotel bellboy, service station attendant, nightclub entertainer, and waitress at the hamburger stand — all may be divers. Like most underwater adventurers, they love to talk about diving and it is relatively easy for web-footed tourists to get acquainted.

At present Joe Shirk's *Scuba Too* is the only full-time dive boat operating on Ft. Lauderdale reefs. It is a 25 foot, open boat, and can carry a maximum of six divers. Joe knows every hump and wrinkle of the reefs and tries to tailor trips to give customers the kind of diving they want. Usually Joe does not permit spearguns on board — but on charters or by special arrangements he will take spearfishermen on trips

that are planned for underwater hunting. He recommends that reservations be made well in advance because he has commitments to local dive shops.

Accommodations, trips, and information on local conditions can be obtained by contacting one of the dive shops listed in SKIN DIVER'S "Diver's Directory," or by writing directly to Joe Shirk at Diving Trips, Inc., 5001 S.W. 90th Way, Ft. Lauderdale, Florida 33315.



Ft. Lauderdale's beaches are reserved for the public; coral reefs, rocky outcroppings are a swimming distance away.

Adventure Cruises, Inc. specializes in dive trips to the Bahamas but they are based in Ft. Lauderdale and are accustomed to arranging overnight accommodations and connections for cruise customers. Barbara McCallister is cruise coordinator and will gladly make arrangements for local dive vacations. Write Adventure Cruises, Inc., P.O. Box 22284, Ft. Lauderdale, Florida 33315. >555



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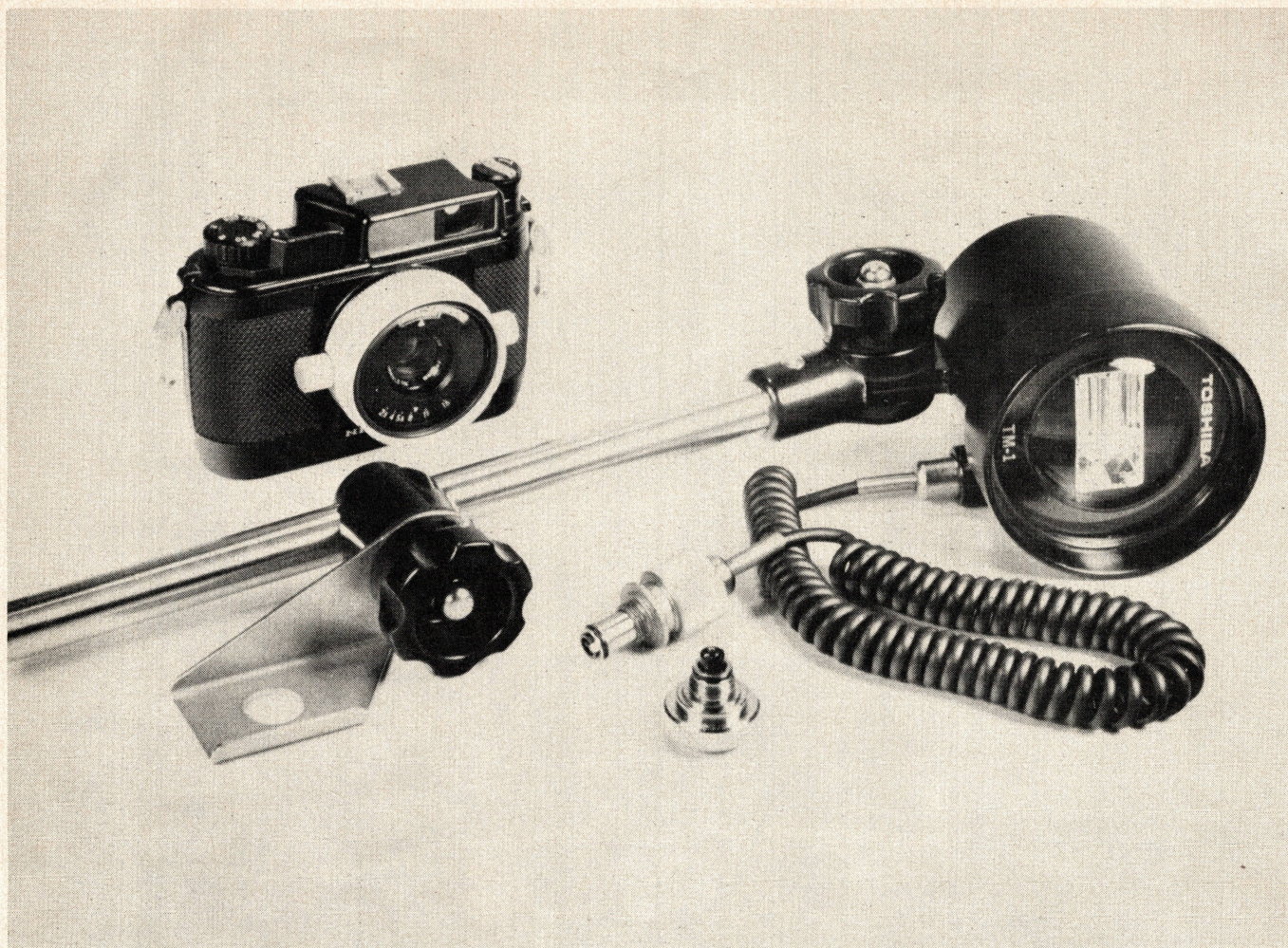
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photography by Authors

THE TOSHIBA TM-1

AN SDM PRODUCT REVIEW

By Jim and Cathy Church

If you are looking for a light-weight, compact, submersible strobe, you should consider the Toshiba TM-1. Priced at \$179.50, it comes complete with an adjustable arm, connector cord with a Nikonos II connector and a bracket-Nikonos camera. A connector adaptor which allows you to use a Nikonos III with the TM-1 is available for \$14.95.

The TM-1 has a molded plastic body which measures only 4.6 inches in length by 3.8 inches in diameter, and the entire system (including the arm and baseplate) weighs in at a mere 2.4 pounds. The front of the body is recessed about a half-inch so the dome port covering the flashtube and reflector is protected from accidental impacts by a circular rim of durable plastic. The three position switch (off/on and test flash), ready-light port and the outer battery-compartment cover are all located at the rear of the strobe body. The switch is large enough for easy operation, and the ready light can be seen easily.

Power is supplied by four size AA al-

kaline penlight batteries which can provide up to about 200 flashes with a recycle time of about six seconds. These batteries can be easily installed by hand without tools:

1. Turn the compartment cover a quarter-turn to the left and pull it free.
2. Turn the retaining screw of the inner battery compartment to the left and remove it from the body.
3. The batteries will now be exposed and can be replaced.

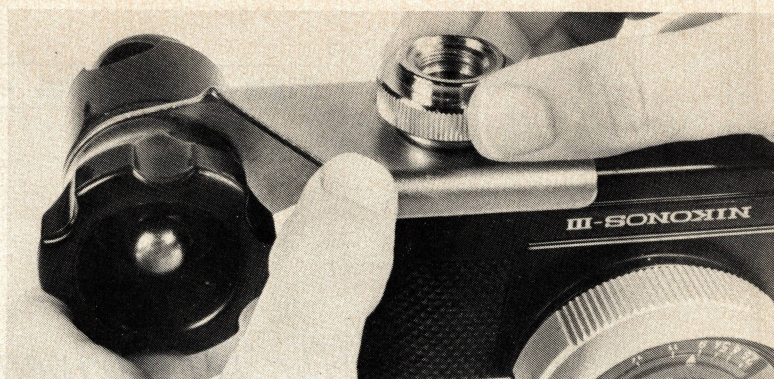
To maximize battery life with a new TM-1, or one which hasn't been used for several months, use an old set of batteries to form the capacitor: flash the strobe several times, and then leave it in the "on" position for a half-hour. Turn it off without flashing it and replace the old batteries with fresh alkalines. By using the old batteries to form the capacitor of the TM-1, the new batteries will last longer. You can also extend battery life by alternating between two sets of alkaline batteries day-by-day.

Toshiba expresses the power output of the TM-1 with a guide number of 41 for

ASA 25 film above water. (Note: The guide number, when divided by strobe-to-subject distance, gives as estimated f number.) For ASA ratings of 64 and 160, we calculated the above water guide numbers to be 66 and 104, respectively. You can convert these above water guide numbers to U/W guide numbers for apparent distances by dividing them by a conversion factor of four.

If you don't wish to become involved with guide numbers, you can use the chart of estimated exposures we have provided as a starting point for your own exposure experiments. Depending on your subjects and local conditions, these estimates should be within one stop of the correct exposure with a TM-1. You can copy the table, with a ballpoint pen, onto masking tape stuck to the right side of the TM-1 body for U/W reference.

The beam angle of the TM-1, measuring 55 degrees vertically and 70 degrees horizontally, will completely cover the picture area of the Nikonos 28mm U/W Nikkor lens. If adapted to a housed camera, it would cover the picture area of a

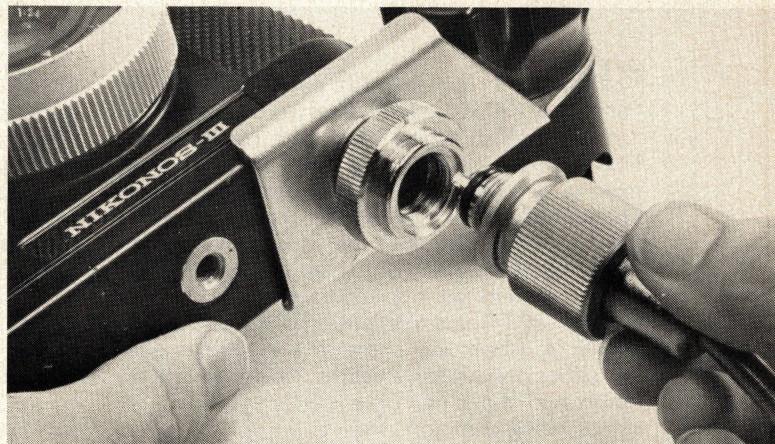


The Toshiba TM-1 is a compact, submersible strobe. The battery compartment covers (above left) can be removed by hand to install batteries. The other photos show how to attach TM-1 connector adapter to Nikonos III.

**ESTIMATED EXPOSURE GUIDES FOR
TOSHIBA TM-1
strobe-to-subject distance**

Apparent Distance	ASA rating		
	25	64	160
1 foot	f11	f16	f22
2 feet	f5.6	f8	f16
3 feet	f4	f5.6	f11
4 feet	f2.8	f4	f8

(estimates rounded to nearest full stop)



35mm camera with a 28mm or longer focal length lens behind a flat port, and for 35mm or longer lenses behind a dome port. The dome port over the flash tube and reflector of the TM-1 helps maintain a wide-beam angle by preventing the beam from becoming significantly narrower underwater than in air because of refraction. With wide-angle lenses, such as the Seacor 21mm SeaEye, or the Nikon 15mm U/W Nikkor, the TM-1 can be used to illuminate principal subject areas, such as a diver against a mid-water background, but it would not cover the entire picture area.

The light emitted by the TM-1 is approximately the color of average sunlight, so you should use regular daylight color films with this strobe underwater. With Kodachrome films, you probably won't need to bother with a filter. But with the Ektachromes, you may wish to use an 81B or other suitable warm-up filter to avoid bluish skin tones.

We tested the Toshiba TM-1 with a Nikonos III, so we used the Toshiba connector adaptor for this camera. The steps for assembling the system with a Nikonos III are as follows:

1. Hold the camera and baseplate together by hand — align the adaptor and begin to screw it into place.

2. As soon as the adaptor begins to tighten, stop turning it and wiggle the baseplate to be sure that it is aligned with the adaptor — you will feel it "click" into

place. Tighten the adaptor with snug finger pressure.

3. Attach the Nikonos connector on the strobe cord to the adaptor with snug finger pressure.

4. Lastly, attach the strobe arm to the Nikonos baseplate.

If you prefer to keep your strobe attached to your Nikonos with an adjustable arm while underwater, the Toshiba arm system may be just the thing for you. It uses two large, plastic adjustment knobs which are easy to operate underwater. The knob which secures the strobe arm to the Nikonos baseplate controls three movements, and the adjustment knob which attaches the strobe body to the end of the arm controls a fourth movement. Together, these two knobs provide the following movements and/or adjustments:

1. The arm can be "lengthened" or "shortened" as needed.

2. The angle of the arm to the camera can be changed.

3. The arm can be rotated within the baseplate bracket to change the direction the strobe is facing.

4. The strobe can be swiveled up or down at the end of the arm.

We believe that the arm is especially useful for close-up photography at distances from about one to two apparent feet. The secret of making adjustments while underwater is to only tighten the knobs enough to hold the strobe in place when

you are composing pictures. The rubber bushings in the knobs should provide just enough friction to hold the strobe steady, but allow you to change its position by hand for some movements. If you detach the arm from the bracket for hand-held lighting, replacing the arm in the baseplate bracket may be a little more difficult than with other systems, but you should be able to handle this with practice.

Maintenance of the TM-1 is simple:

1. After the dive, wash the entire system — camera and strobe — with fresh water before it is disassembled. Loosen the adjustment knobs so the wash water can get the salt out of tight places.

2. Occasionally spray the connector cord with a thin film of silicone spray to protect the rubber.

3. Remove the batteries when the TM-1 is placed in storage.

4. Keep the O-ring of the outer battery compartment cover clean and lightly coated with silicone grease.

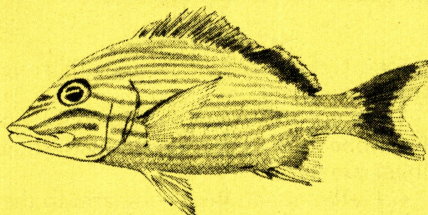
5. Use a soft cloth to clean the threads of the connector and camera flash socket, and lubricate them with a thin coating of silicone grease.

The TM-1 Underwater Electronic Flash is manufactured in Japan by the Toshiba Photo Products Co., Ltd. It is distributed in the U.S. by Elmo Mfg. Corp. The Elmo East Coast office: 32-10 57th St., Woodside, N.Y. 11377. The Elmo West Coast office: 21220 Erwin St., Woodland Hills, Calif. 91364.

The Bluestriped Grunt

(*Haemulon sciurus*)

"Ronco" is the Spanish name for the fish commonly called the grunt. The word comes from "roncar," which means "to snore." The common English name, grunt, also refers to the noise-making abilities of the fish in or out of the water. The grunting or snoring sound is made when the fish grinds its strongly developed pharyngeal teeth together. The swim bladder next to the teeth functions as a sound box and amplifies the noise. □ Grunts comprise the Pomadasyidae family of fishes, and many of these fishes will be yellow, or have some yellow, with some sort of horizontal marking, blue stripes being common. The bluestriped grunt, *Haemulon sciurus*, is one such species, yellow with blue stripes. Two other *Haemulon* species could be confused with this fish: *H. plumieri* (white grunt) and *H. flavolineatum* (French grunt). All have a similar yellow-blue pattern. However, *H. plumieri* has the blue stripes only on the head and not on the body, plus larger scales above the lateral line. *H. sciurus* has equal-sized scales and stripes all over the body. In *H. flavolineatum*, the stripes below the lateral line are diagonal. Also, the bluestriped grunt has a very noticeable dark tail, which the others do not have. While many of the other grunts have black tails, they do not have the yellow and blue markings. The young of *H. sciurus* are similar to many of the young of other *Haemulon* species: small and cigar-shaped with a blackish horizontal stripe down the middle of the body with a blotch near the tail.



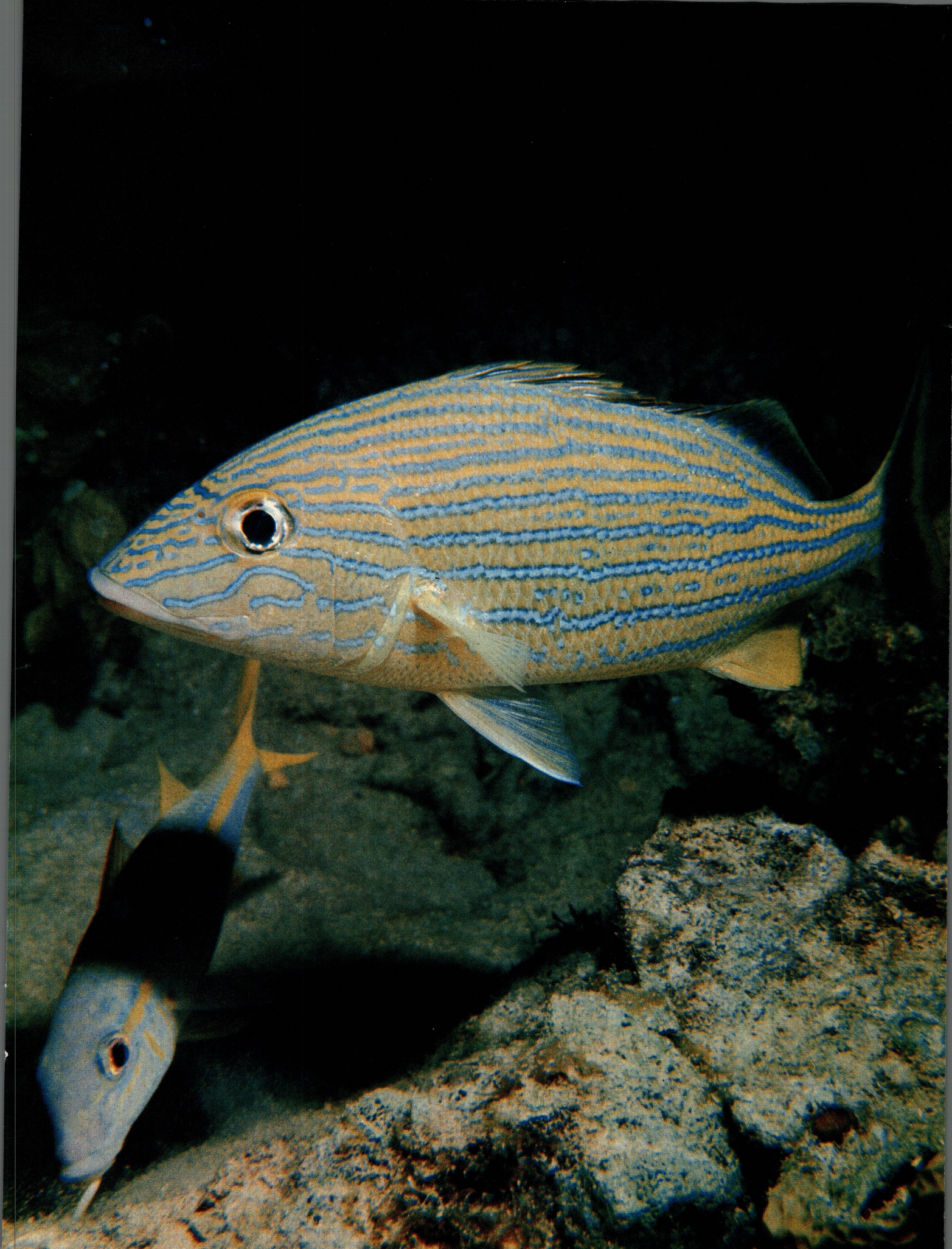
The bluestriped grunt is said to grow to 18 inches, but it is more likely to reach about 13-15 inches. □ *Haemulon* is the generic name applied to almost all grunt species. John Randall notes that some ichthyologists refer to the family as Haemulidae rather than Pomadasyidae. According to ichthyologist/curator Warren Zeiller, Haemulidae comes from the Greek meaning "bloody gums," which is an obvious reference to the bright red mouth of the fish. All grunts have this red mouth, and it is an identifying characteristic of the species. □ The grunts are known to engage in a

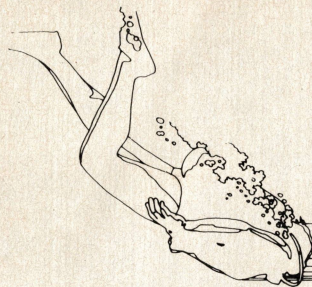
"kissing" act. Very often two individuals have been seen face to face, pushing against each other with their mouths. It isn't known for sure whether this has anything to do with mating or if it is territorial aggression. More often the fish will be seen in a swarm on a shallow-water reef, sometimes under a protective ledge,

hanging suspended in dense packs as they face the current. At night they spread out individually over the reef to feed; their diet, according to John Randall, consists primarily of crustaceans, mollusks, annelids, some seagrass and algae. □ The bluestriped grunt is very common in the Bahamas and according to James Bohlke and Charles Chaplin is most often encountered with *H. plumieri*, the white grunt. The two ichthyologists have recorded this fish from Bermuda and the Bahamas, South Carolina to southeastern Brazil, including the Gulf of Mexico and the Central American coast. ➤

Photo By Peter Capen - Text By Hillary Hauser

Photo taken in 35 feet of water in Georgetown Harbor off Grand Cayman Island. Capen used a Rolleimarin with a #2 close-up lens, Honeywell 810 strobe, Ektachrome X film. Shot at f22, 1/125 sec., 18" from subject.





News Briefs



By Hillary Hauser

CHINESE CACHE

\$5 billion in diamonds, artifacts, cash, gold and other metals is believed to be aboard the sunken Japanese freighter *Awa Maru*, and an American salvage group is out to get it. The ship is in 185 feet of water a few miles off China and the group is seeking permission from China to search for it. The group consists of Jon Lindbergh, Scott Carpenter and Bill Bunton, the latter two on the Sealab II diving team in 1965. Also in the group is retired Navy Captain John E. Bennett, navigator of the submarine *Queenfish* when she sank the *Awa Maru* in the Formosa Strait in 1945. The *Awa Maru* was ostensibly a hospital ship but had been picking up strategic metals and treasures plundered from occupied territories. The plan to salvage the ship had been cooking for the past three years, according to Mrs. Jon Lindbergh, and permission is being worked out by Bunton. The treasure aboard the ship includes 40 tons of gold ingots, 12 tons of platinum (\$58 million), 40 cases of art treasures from Southeast Asia, 150,000 carats of uncut diamonds in three safes, 2000 tons of tungsten (\$4 million) and 3000 tons of tin (\$21 million). We don't know yet the status of the project, or who would do the salvaging. It was speculated that the Chinese might possibly want to do the salvaging themselves.

OTTER TITLE

California's Governor Jerry Brown has introduced a bill to make the sea otter a state marine mammal, alongside the California gray whale. About a year ago, the whale

had been designated the state marine mammal, with a bill authored by assemblyman Robert Badham (R.-Newport Beach). Friends of the sea otter were opposed to it because the otter is more indigenous to the state whereas the whale migrates up and down the entire North American coast. So, Brown wanted to remedy the situation by having the otter and the whale share the title.

WHALE CONCERT

On the 20th and 21st of this month, an innovative teach-in concert will be staged in Tokyo by the Dolphin Project (Miami, Fla.) wherein participants will try to reach a section of the Japanese population. Ric O'Feldman, who heads the effort to gain Japanese support for whale conservation feels the event will help the Japanese to see how very few whales are left. O'Feldman is optimistic: "Now, even the union representing the Japanese whalers supports the stop-whaling movement," he says. Dr. Clifford Uyeda, of the Whale Issue Committee of the Japanese-American Citizens League, feels Japan will cease commercial whaling before the spring of 1977.



DIVE STANDARDS

In November the Occupational Safety and Health Administration (OSHA) officially withdrew the emergency temporary standard for safety and health of commercial divers (which was to have gone into effect last July). The agency said that the action would allow a permanent standard to be drawn up. (Morton Corn, asst. secy. to OSHA, hoped it would be done by the first part of this year, according to the Wall St. Journal.) The temporary standard had been issued last June, but was contested by the dive industry, which said no emergency existed. The standard was suspended indefinitely by a federal appeals court. According to Ocean Science News, diving for "instructional or educational/scientific purposes" using only open-circuit compressed-air scuba and no decompression procedures is specifically excluded from OSHA's proposed permanent standard.

ROMANTIC DINING

Ropewalk Seafood Bistro is a new seafood restaurant in New York City that features fresh fish, singing waitresses, "dancing tropical fish," a roving magician, and an in-house scuba shop. Diners get an underwater slide show, can buy dive equipment, and the Bistro even arranges tour vacation packages in conjunction with World Wide Divers, Inc., of New York. The restaurant was featured on ABC-TV Eyewitness News and Cue Magazine voted it one of New York's ten most "romantic restaurants."

14th CENTURY FIND

A Danish schoolboy has found a 14th century shipwreck, and gold, in his own backyard. Jesper Egersoe, 16, was snorkeling in 1975 near his family's summer cottage on the west coast island of Zealand, when he found an antique pewter plate. He sent it to the Danish National Museum. Last summer he found 94 gold coins. He kept the find a secret, except for telling his parents and the museum, which sent professional searchers to the spot. They found 16 more coins, pewter plates, and some other odds and ends. Archaeologists identified the coins as English nobles minted in the reign of Edward III (1327-77), making the wreck at least 600 years old. The coins are worth about \$100,000. The ship was a kogge, or sailing barge, 45-60 ft. in length, which was lost near the Skaggerak, between Tisvildeleje and Raageleje. The museum is now raising money to bring the wreck up and has awarded Egersoe \$2,450. They said he deserved more, but they couldn't afford it.

"STILL CONVINCED"

That Loch Ness monster hunt last summer has produced no monster. The search, cosponsored by the New York Times and the Academy of Applied Sciences, Boston, came up with some other interesting things, including a WW II airplane and evidence of an ancient culture. According to news reports, the expedition "discovered underwater stone rings constructed by an ancient civilization when the

Loch was lower." Charles W. Wyckoff, chief of photography for the monster hunt, said he was disappointed that they hadn't found the monster, but that he was not discouraged. "I'm still convinced in my own mind there's something there," Wyckoff said.

WHALE TALK

Enthusiasm and support for the California gray whale is growing by leaps and bounds in the state. Five to ten thousand people turned out for the California Celebrates the Whale event in Sacramento (N.B., Feb.), hosted by Gov. Brown. Joni Mitchell and Country Joe McDonald entertained. While all this was going on, the gray whale had already begun its annual 14,000 mile round trip from the Bering Sea to its spawning grounds in Baja. At Gov. Brown's urging the independent California State Parks Foundation gave \$10,000 to a pod of San Francisco electronic specialists to eavesdrop on what the whales say to each other. The plan was to hang microphones on buoys one-seven miles offshore, and then record the chitchat. The long-range idea is that humans might send messages back to the whales in their own lingo, warning them of oil slicks or other hazards.

AEGEAN STUDY

Greece and Turkey have agreed to establish a joint commission on the legal aspects of their Aegean Sea dispute, which came close to war last summer. The two countries are squabbling over territorial and mineral claims in the sea which separates them. Turkey says they must share the Aegean's continental shelf, but Greece claims that the Greek islands which are close to the Turkish coast make the sea, in effect, a Greek lake. The Intl. Court of Justice at The Hague has given the two countries until the end of this year to submit their proposals for an agreement.

"THE SEAS MUST LIVE"

In November the World Wildlife Fund, an international conservation group, met in San Francisco, and embarked on a two-year campaign to raise \$12 million to help protect the resources of the seas. The campaign will be run under the slogan, "The Seas Must Live," and will use the humpback whale as its symbol. Sir Peter Scott, a British naturalist who is president of the organization, said the campaign was the biggest attempted so far. The first stage will focus on setting aside critical areas necessary for the survival of species and the production of food, including an international system of sanctuaries for whales and porpoises. Proposed sanctuaries are the calving lagoons used by the gray whale along the coast of Baja, protected waters for the humpback whale off Hawaii, and for the blue whale the Gulf of St. Lawrence. Other efforts will be directed toward protecting seal habitats, sea cow grazing beds in warm tropical seas, and estuaries and marshes used in the great migrations of birds.

The conference in San Francisco, held at the St. Francis Hotel, attracted many notable people who came to give their support. Included was King Carl XVI Gustaf of Sweden who attended the press conference on the final day. Also at the press conference was Jacqueline Bisset (*The Deep*) who gave her support to conservation efforts. Jacques Piccard, Swiss scientist and underwater explorer (*Trieste*, *Ben Franklin*), deplored the use of deep-ocean trenches for nuclear disposal. Dr. Sylvia Earle spoke out for an ocean ethic in dealing with areas such as Palau. (Fund members are particularly concerned with a proposal by the U.S., Japanese and Iranian interests to build a superport in the Palau archipelago. The group has called for a special ecological and economic study of the area, saying that the proposed superport would destroy one of the most spectacular and pristine environments in the Pacific.)

Since its inception in 1961, the World Wildlife Fund has promoted and financed a number of preservation projects around the world. The most ambitious was a \$1.5 million effort to save the tiger in Southeast Asia. For information, write WWF, 1319 8th St., N.W., Washington, D.C. 20036.

WALKER'S WRECK

The *Nuestra Senora de la Maravilla* has attracted yet another treasure hunter, who thinks he's found it. Multimillionaire Robert Abplanalp, known to most of the world for his friendship with Richard Nixon, has established his island, Walker's Cay, as headquarters for a vast treasure hunt. Abplanalp has a crew of divers, archaeologists, U/W



artists and photographers, who are working on a wreck near the island. Abplanalp believes his wreck fits the description of the *Maravilla*, although previous salvors (Bob Marx, Jack Kelley) say they have the true location of the *Maravilla* and Abplanalp is not on the wreck at all. Abplanalp is proceeding with his salvage anyway, and has brought in Oceanus One, Inc., a Florida company formed by Rick Vaughan, and the *Aventura*, Vaughan's work boat. So far, the main salvage has been cannons (52 counted so far). Skeptics say the ship isn't the *Maravilla*, that it might possibly be a worthless old hulk full of useless cannons. (Ed. note: *Still More Adventures*, a new book by Robert Marx, Mason/Charter,

New York, indicates that the shipwreck Marx located in 1972 was not the *Maravilla*, but the *Al Miranta*.)

SHARK BOOK

Richard Ellis, well-known marine artist who has painted whales for Audubon, Scientific American, SKIN DIVER and other magazines, has now painted the shark. His new book, published in November, is *The Book of Sharks* (Grosset and Dunlap) and features plenty of color reproductions of his shark paintings. In his book, Ellis includes shark stories and the experiences of experts/adventurers such as Perry Gilbert, Peter Gimbel, Ron and Valerie Taylor, Stan Waterman, Eugenie Clark, Jack Randall, David Doubilet and Peter Benchley. Twenty original paintings, 86 drawings, together with 120 photos, illustrate each species of shark which are defined and described by the author, and augment scientific details and biographies. 320 pages, \$25.

NESSIE DEFINED

The Loch Ness monster is now official. She or he, known to most as Nessie, has been included in the new update to the Oxford English Dictionary. Joining Nessie are "mugging" and "hobbit," created by John Tolkien.

ODDS AND ENDS

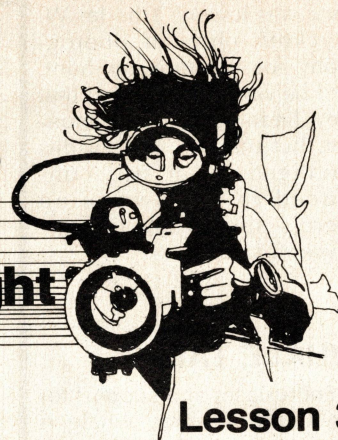
When Capt. Bligh's log went up for auction last November (N.B., Feb.) it was snapped up in 55 seconds for \$90,730 . . . The U. of Hawaii is the new home for the Law of the Sea Institute. The transition will be made from U. of Rhode Island some time before June . . . Flood waters damaged historic Venice sites last fall as lagoon waters rose 3½ feet above average level . . . A U. of New Hampshire researcher says that red tide may be triggered by pollution dumped into oceans through rivers. In that light, the Council on Environmental Quality has determined that ocean dumping of dredge materials and sewage sludge has increased despite passage of regulatory legislation four years ago.

READERS ARE INVITED TO SEND ITEMS TO NEWS BRIEFS EDITOR HILLARY HAUSER, 8490 SUNSET BOULEVARD, LOS ANGELES, CALIFORNIA 90069

U/W Photography In 12 Easy Lessons



Getting Started With Natural Light



Lesson 3

By Jim and Cathy Church

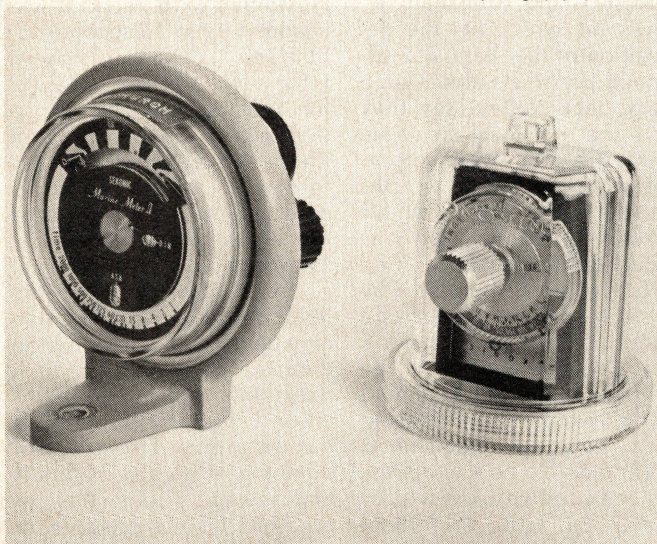
The objective of this month's lesson is to get you started with your first natural light photographs. To keep things simple, we will begin with the basic equipment and how to get it ready, suggested above water and pool practice, an "exposure meter" dive and will end with an open-water photo dive. We won't worry about the theory and definitions of such things as f stops, shutter speeds or ASA ratings at this time. All you will need now is a working knowledge of how to read the exposure meter, set the camera controls and take a picture.

THE BASIC EQUIPMENT

You will need a housed or Nikonos camera and an exposure meter. We strongly recommend that the exposure meter be attached to the camera with a bracket, and that you use an accessory sportsfinder rather than the small built-in viewfinder of a housed camera or Nikonos.

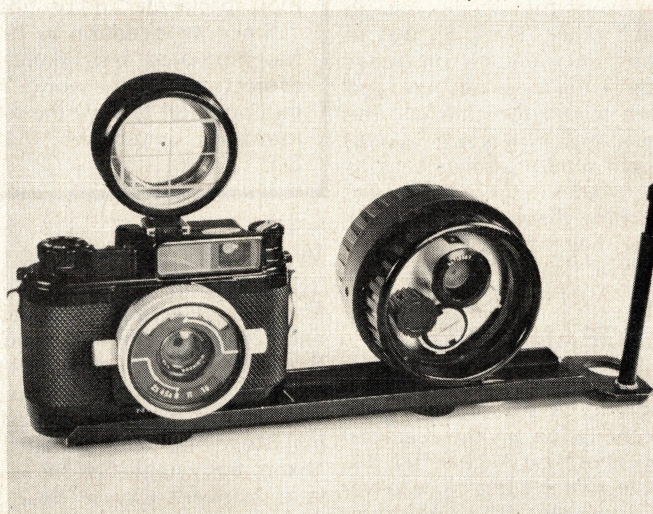
Two of the exposure meters most commonly used by divers in the U.S. are the Sekonic L-86, in a plastic housing, and the more expensive submersible Sekonic Marine Meter. Although priced over a hundred dollars, the Sekonic Marine Meter is the best choice if you are a serious U/W photographer. It is more accurate and is direct reading — once it is preset, you read it directly as you would the speedometer of your car. With the less expensive L-86, you must stop and align two needles each time you take a reading.

photography by Authors



Two exposure meters most commonly used by underwater photographers are the Sekonic Marine Meter, shown in an Oceanic Products Meter Mount, and the Sekonic L-86 in a plastic housing.

Both Oceanic Products and Subsea Products manufacture brackets for attaching Sekonic meters to your camera. The Oceanic Products meter mounts attach either to the handle of the Oceanic Products Nikonos Pro-Grip or to the top of their Hydro-35 housing for the Canon F-1 or Nikon F. These meter mounts can also be attached to the tripod socket of a Nikonos III with a tripod screw or bolt. They can also be attached to the tripod socket of the flash socket plug of a Nikonos I or II, but be sure that the meter doesn't rotate and loosen the plug. Subsea Products also has brackets for attaching either the Sekonic L-86 or Sekonic Marine Meter to the Subsea Nikonos Handle Unit. We frequently attach the Subsea meter bracket for the Sekonic Marine Meter to a Subsea Double Nikonos Bracket in place of the left side Nikonos. This involves pulling the guide pin out of the bracket with pliers, and attaching the bracket to the Nikonos bracket with a washer and tripod screw.



This camera system can be held with one hand. Mounted on a Subsea Double Nikonos Bracket, are a Nikonos III with Subsea Optical Viewfinder and Sekonic Marine Meter in Subsea Bracket.

If you have a housed camera with a built-in exposure control, you won't have to worry about attaching a meter to your camera. Automatic exposure controls generally work well providing that the system doesn't depend on shutter speeds longer than 1/30 second.

In addition to your camera and exposure meter, you will usually need an accessory sportsfinder. These viewfinders attach to the top of a camera housing or to the top of a Nikonos. For the Nikonos camera, the Seacor Seaview III Optical Viewfinder is a good choice. We mask the front of the Seaview with black tape to accentuate the picture area. Some U/W photographers prefer the Ikelite or Subsea optical viewfinders, or the

simple Nikonos plastic (or rubber) sportsfinders.

Your goal should be to have a camera/meter/viewfinder system that can be held with one hand. Avoid cords, neck-straps or any system that requires two hands to hold. You should be able to drop everything quickly should an emergency situation arise.

CHOOSING FILM

Start out with black and white film so your first mistakes will be less costly. For clear, bright conditions, such as a pool or tropical waters, try Kodak Plus-X (PX 135). For darker conditions, such as California coastal waters, try Tri-X (TX 135). Later, when you try natural light color slides, we recommend Kodak High Speed Ektachrome (EH 135). For color prints, it is less expensive to shoot slides and then have prints made from the slides you like the best.

FILM SPEEDS, METERS AND EXPOSURES

If you are a beginner — and feel swamped with numbers — don't worry about it! You only have to remember one number for now: 1/60 second. This is the shutter speed that we want you to start with as it is the shutter speed you will be using later when we move on to strobe (electronic flash) U/W photography. So, given this one number — 1/60 second — here is how you set your meter and camera for the correct exposure:

1. Look at the upper right corner of the instruction sheet which comes with Kodak film. With Kodak Tri-X film, it will say "Film Speed ASA 400."

2. Set the ASA adjustment on your exposure meter for this film speed of 400.

3. When you aim the meter at your subject, the meter will give you a number (called an f stop or f number). With the Sekonic Marine Meter, the dial will point directly at this f number when the meter has been preset for 1/60 second and ASA 400. With the Sekonic L-86, match the two needles and see what f number is aligned with 1/60 second.

4. Set the f number indicated by your exposure meter on the camera aperture control. If the meter indicates an f number that is between the numbers on your camera, you can set the aperture control between the f numbers on the camera.

GETTING YOUR CAMERA READY

Before loading the camera with film, work the controls and trigger the shutter a few times to see if the controls all work freely. Be sure that the lens aperture opens and closes when you operate the aperture control, and that the lens elements move forward and backward slightly when you operate the focus control. If the O-rings that seal the camera or housing are dry, coat them with a thin layer of silicone grease.

With the Nikonos III, we have made a few modifications in the film loading procedure presented in the owner's manual. Our procedure is as follows:

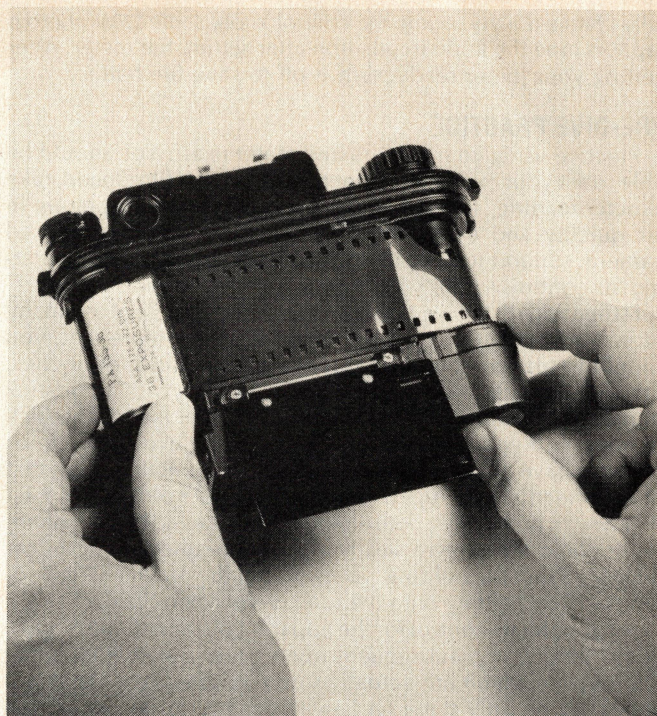
1. Set the shutter speed dial to "R" rewind, pull the rewind control upward to the rewind position and then remove the inner camera body from the outer casing.

2. Lay the inner camera body face down on a sheet of clean paper with the top of the body away from you. This will free both hands, and you probably won't have to pick the camera body up again until the film has been completely threaded.

3. Open the pressure plate and inspect the rear of the inner body for dust or smeared grease. Clean if necessary.

4. Pick up the film cassette. Hold the cassette and the strip of exposed leader in one hand, and take up the slack in the cassette by rotating the knob at the bottom of the cassette. This is quicker and easier than using the camera rewind system as shown in the manual.

5. Lay the cassette in place on the inner body, and thread the film leader into the take-up spool. Rotate the spool with one finger on the serrated lower edge of the spool until the perforations at both the top and bottom of the film engage the film advance sprockets.



Loading the Nikonos III with film.

6. Close the pressure plate and place the inner camera body inside the outer casing.

7. Set the shutter speed to 1/60 second (or any other speed) and advance the film by triggering the shutter release two times. The rewind knob should rotate when the film is advanced which indicates that you loaded the camera correctly.

8. Reset the rewind knob to its recessed position by turning it 180° back from the white arrow.

9. When replacing the lens assembly, you may decide to put it on upside down. This way you can read the aperture and focus scales by merely tipping the camera over backwards.

GETTING YOUR METER READY

Begin by checking the zero adjustment. With a Sekonic L-86, the needle should align with a small black dot at the left side of the scale when the photo cell is covered. With the Sekonic Marine Meter, the needle should point to "zero" when the meter is turned off. These, and most other exposure meters, can be calibrated for the zero adjustment with a small screwdriver. Check your particular owner's manual.

You can use the f16 rule as a basic accuracy check. The f16 rule is simple: The basic exposure for an average, above-water subject, that is frontlighted with bright sunlight, is f16 at the shutter speed closest to the ASA rating of the film used. For example, with the sun behind you on a bright day, your meter should read close to f16 at 1/60 second when the meter is set for ASA 64 and aimed at an average above-water subject. Likewise, it should read close to f16 at 1/25 second if set for ASA 160. You can also compare your meter readings to the suggested exposures for cloudy-bright, heavy overcast and open shade that are printed on the film instruction sheet.

When you place a Sekonic L-86 inside its plastic housing, be sure that the black mask which steadies the front of the meter is seated correctly. If not, it can prevent the lid from closing completely and forming a seal with the O-ring. Do not use excessive force when you screw the lid into place as you can crack the plastic. Visually examine the O-ring after the lid is closed. You can see if it is pressed evenly against the transparent plastic to make a seal.

With the Sekonic Marine Meter, preset the meter for shutter speed and the ASA rating. Because the settings can be acciden-

tally changed if you bump the control knob, some U/W photographers tape the knob in position after setting the meter. After getting your meter ready, turn it off to save the battery.

PRE-DIVE PRACTICE

Practice using your camera and meter in air. You should be able to set your exposure meter for the correct film speed, take a meter reading, set the camera controls and take a picture in air quickly and easily. If you have a large, bulky housed camera, support it on a stool or table top and practice operating all controls while wearing your diving mask.

Estimating distances will also take practice. Because many of your U/W pictures will be taken at about three feet, you should be able to "eyeball" this distance within a few inches. Practice by walking around your home or yard with a yardstick or measuring tape. Reach out and touch objects with the stick or tape until you can estimate three feet by eye fairly close.

If you have access to a swimming pool, practice there first before heading for open water. Practice holding yourself steady with both knees, both elbows and one hand on the bottom as you hold the camera steady and gently squeeze the shutter release. Practice holding yourself steady on the "Wall of Cayman" by holding onto the rung of your pool ladder.

Set your focus control for the apparent distances during your pool practice and subsequent open water dives. Remember that objects which are actually four measured feet away will appear to be only three feet away because of the refraction (bending) of light at the air/glass/water interfaces of your face mask and the flat port over your camera lens. Use a cord or stick that is four feet long to practice measuring.

Most accessory viewfinders are angled so the line of sight of the viewfinder intersects the line of sight of the camera lens at a predetermined distance. With the Nikonos 28mm and 35mm sportsfinders, they intersect at about 6.5 feet. Therefore, at closer distances you must aim a couple of inches above the intended center of your picture to compensate for parallax. If you want your diving buddy's nose in the center of your picture at three feet, aim between his eyes. The Ikelite optical viewfinders are adjustable for angle, but make sure that you tighten them as the adjustment can slip if the viewfinder is loose or is accidentally bumped.

AN EXPOSURE METER DIVE

Before you take your camera into open water for the first time, we suggest that you take an "exposure meter dive." The dive plan being as follows:

1. As soon as you enter the water and have adjusted your dive gear, examine your meter for possible leakage.

2. Settle on bottom gently with slow-motion movements. Depending on the bottom and locale, you can stand, kneel, sit or lie down. The important thing is to move as little as possible to avoid scaring marine creatures away and stirring up sediment. Just one kick with a fin can sometimes raise a cloud of sediment that can ruin the immediate area for U/W photography for several minutes.

3. Force yourself to stay in one place for several minutes and examine every feature around you. Ask yourself: What could I photograph here? Get your eyes close to the bottom and view potential subjects with an upward angle. Check your exposure meter controls and settings — practice taking readings at downward, level and upward angles.

4. Move to another area — use your BC to help raise yourself off the bottom with minimum use of your fins. Keeping several feet off the bottom, swim to a new area and settle on the bottom again. As before, minimize your body movements, get close to the bottom and look for potential subjects.

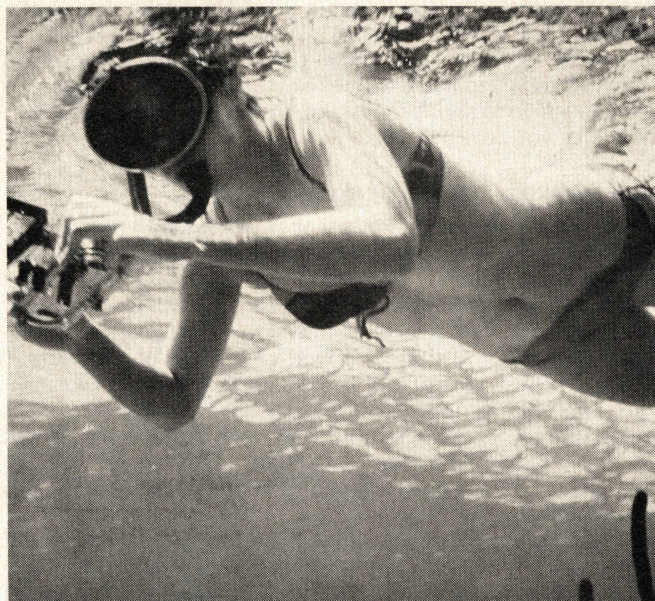
By forcing yourself to limit your dive to only a few areas, and staying motionless at each of these sites, you will soon find that the less you travel and move about, the more you will see. Eels, lobsters, plume worms, delicate nudibranchs and camouflaged shrimp will soon come into view. The exposure meter dive

can be a valuable experience if you will use it to help develop your dive techniques and visual perspective.

YOUR FIRST PHOTO DIVE

When you take your camera into open water for the first time, try to remember these basic rules:

1. Adjust your buoyancy and relax.
2. Get lower than your subject.
3. Get close to your subject.



Get lower than your subject and close to it.

You must have complete control over your body movements and buoyancy before you can safely think about your U/W photography. This is no time to be adjusting your mask or fin straps, or be learning how to operate a new BC unit. Get yourself at ease in the water first.

Get lower than your subject and use level or upward camera angles to separate your subject from the bottom. This is especially true when you are photographing dark subjects in turbid water. If you use a downward camera angle to photograph a diver in a black wet suit against a dark bottom, he will blend into the background in your picture. Rather, get lower than your diver and photograph his silhouette against the mid-water or bright surface background.

Get close to your subject if you want fine details in your



In dark, turbid water, work within one-fifth of your visibility if you want sharp details or crisp outlines in your silhouettes.

pictures. In turbid water, work within one-fifth of your visibility if you want sharp details or crisp outlines in your silhouettes. Even in clear water it is difficult to photograph fine details at distances greater than ten feet. The minute particles suspended in the water, loss of color and contrast, and camera movement all combine to reduce picture sharpness proportionately with increases in camera-to-subject distance.

FINDING SUBJECTS

Your choice of subjects will be limited when you are working with natural light with a camera such as a Nikonos with a 35mm lens. You will often be working with shapes and silhouettes rather than colorful close-ups of tiny marine creatures. In California waters, you might begin with the large, white anemones, schools of fish in mid-water, or an upward silhouette of your diving buddy in a kelp forest. In Caribbean waters, upward shots of divers along walls and ledges can result in excellent pictures. In Hawaii, lava tubes are perfect frames for your diver portraits. Although we would all like to have pictures of sharks, seals and baby whales, they are not always around when you want them. Therefore: Examine each seafan, tube sponge, ledge or kelp frond carefully as it may become or help frame a subject. Definitely avoid the general scenic shot with a tiny subject lost in the distant background.



Walls and crevices can be used to frame your subjects. This photo was taken with a Nikonos, with a Seacor 21mm lens.

EXPOSURE METER TECHNIQUES

Here are a few basic techniques for getting the most from your exposure meter:

1. When working in shallow water, beneath a bright surface, tilt the meter downward slightly when you are working with level camera angles. You can use your hand to shade the photo cell from the bright surface above.
2. For sharply outlined silhouettes, such as a diver in the entrance of a tunnel, or against the surface above, take your meter reading from the bright background behind the diver.



Upward camera angles can make interesting photographs. For a sharp silhouette, expose for the bright area behind the subject.

3. For subject details, such as the texture of a coral or tube sponge, take the meter reading only a few inches away.
4. In turbid water you usually won't get sharp details unless you can get close to a bright subject such as a white anemone. In this case, expose for the anemone and let the background go dark. With dark subjects, such as a diver, get below him. If your meter shows that the background is brighter than the diver, you will at least get his silhouette.
5. Until you have experience with your meter, it is best to bracket your exposure. That is, if your meter indicates that the exposure should be f5.6, take exposures at f4, f5.6 and f8. One of these should be correct.

ESTIMATING EXPOSURES WITHOUT A METER

Estimating exposure settings without an exposure meter is tricky! With bright, overhead sun and clear water, use the f16 rule to estimate the above water exposure. Open by two additional stops for the first ten feet of depth, and an additional stop for each additional ten feet down to about fifty feet. This gives you a rough estimate for level camera angles. Upward silhouettes, with the sun behind the subject, will probably be made at f16 or f22. However, if the sun is low, or the water turbid, wider lens openings will be needed. Don't fight it — get a good exposure meter.

PLAY IT SAFE

In addition to your camera gear, you should have a BC, dive watch or Bottom Timer, depth gauge, pressure gauge and a good diving buddy. You should take extra precautions when photo diving because it is easy to become engrossed in the thrill of capturing alluring sea life on film and forget such details as time and depth. On wall dives and repetitive deep dives, you can strap a depth gauge and Bottom Timer to your camera bracket so checking time and depth become as natural as reading your exposure meter. As your diving instructor would say: Plan your dive, and dive your plan.

SUGGESTED ACTIVITIES

1. Try the activities described in this article: above water and pool practice, exposure meter dive and open water body control.
2. Check your aim. Using black & white film in a pool, carefully aim at a constant target, such as the light on the pool wall, and take a series of pictures from about three to six feet at one-foot intervals.
3. Turn the camera on its side for a vertical picture and repeat the above test.
4. Have the film developed only (avoid the cost of prints) and see if your aim was accurate.

QUESTIONS AND ANSWERS

1. According to the f16 rule, which shutter speed should be used with bright sun, f16 and ASA 400?
 2. If an U/W subject is actually four feet away, what distance would you set on the camera focus adjustment?
 3. What is the maximum distance for sharp pictures in water with 15 feet of visibility?
- ANSWERS: (1) 1/500 second, the closest shutter speed to the ASA rating. (2) Set the focus adjustment for three feet — the apparent distance. (3) About three feet — one-fifth of the U/W visibility. However, you may still get effective upward silhouettes at further distances.



"It's finger lickin' good!" A Cucumaria removes food from its tentacles. California's largest cucumber, Stichopus californicus.



Ocean Gallery



A sedentary California sea carrot, *Cucumaria*.



CALIFORNIA'S SEA CUCUMBERS and CARROTS

Text and Photography by Mark E. Gibson

Vegetables of the sea? Well, not exactly. As a matter of fact, "sea cucumber" is the common name for a small group of animals frequently seen by scuba divers. Found in most oceans around the world, these critters are especially common in California.

The name cucumber is fairly descriptive because they are cucumber in shape, right down to all the little bumps and spines, but that's where the similarity stops. These beasts are soft and mushy, kind of like a weakly-inflated, water balloon. The size of many cucumbers is another story also. Three feet long and four inches in diameter is not uncommon for California's largest roving type, *Stichopus californicus*. The sedentary type, however, range from ten inches long to small enough to be examined whole under a microscope.

Almost completely masked by evolutionary change, the sea cucumbers are really close cousins to sea stars and sea urchins. They all belong to the phylum Echinodermata.

A first encounter with one of these critters can be most frightening—they are covered with spines almost half an inch high. But nature is deceiving: these formidable spines are simply extensions of the water-filled balloon. Only a digestive tract and some other small organs rest in the cavity that looks like there would be lots there. Give it the squeeze test—ugh!

A disturbed roving cucumber responds in various degrees. Nearly always it will shrink up into a football shape. But upon extreme agitation it may push its normally interiorly located respiratory tree and other organs exteriorly hoping the predator will be satisfied with that for a meal. The cucumber will regenerate these vital parts in about a month.

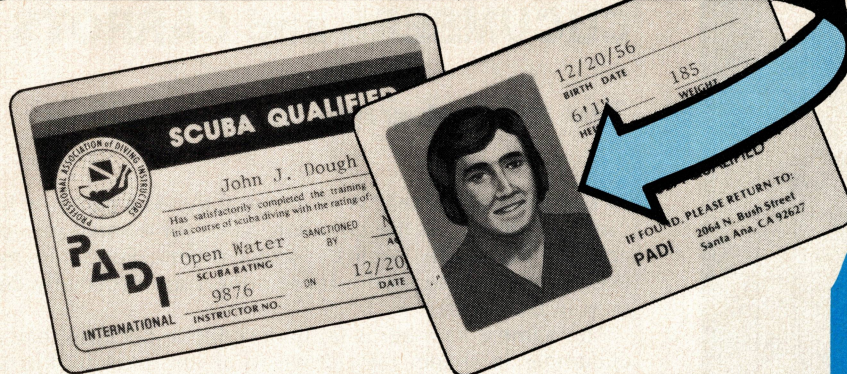
The sedentary types of cucumbers, known scientifically as *Cucumaria* species, have essentially the same body shape, but cracks and crevices in rocks are the homes of these cowardly souls. All the diver usually sees is the beautiful oral tentacles extended for feeding. With their posterior end first into the crevice and their anterior end and oral tentacles exposed, these critters bear a close resemblance to carrots in the garden (as we see them). The tentacles are one of the most beautiful and delicate forms to happen upon while under water. These flowers vary from one-eighth inch to four inches in diameter.

Our local cucumbers are equipped with between five and ten of these tentacles, depending on the species, and they serve a double purpose: respiration and feeding. The presence of the tentacles in open water is sufficient surface area for *Cucumaria* to use them as lungs. However, their primary purpose is for feeding. The minute branches of the tentacles trap microscopic goodies floating by. Then, one-by-one, the tentacles are stuck into the cucumber's mouth where the trapped goodies are removed.

California cucumbers seem to have a color preference for brown. All the *Stichopus* will be brown to orange, while *Cucumaria miniata*, the most common sedentary type, usually is an intense orange. Other sedentary species come in speckled black on white, black, yellow, and white. Usually each species has its own color and tentacle numbers and arrangement. *Eupentacta quinquesemita*, a one-inch roving type, is easily distinguished from all the other cucumbers because of its pure white color and furry appearance. Because it is so small it frequently is overlooked by divers.

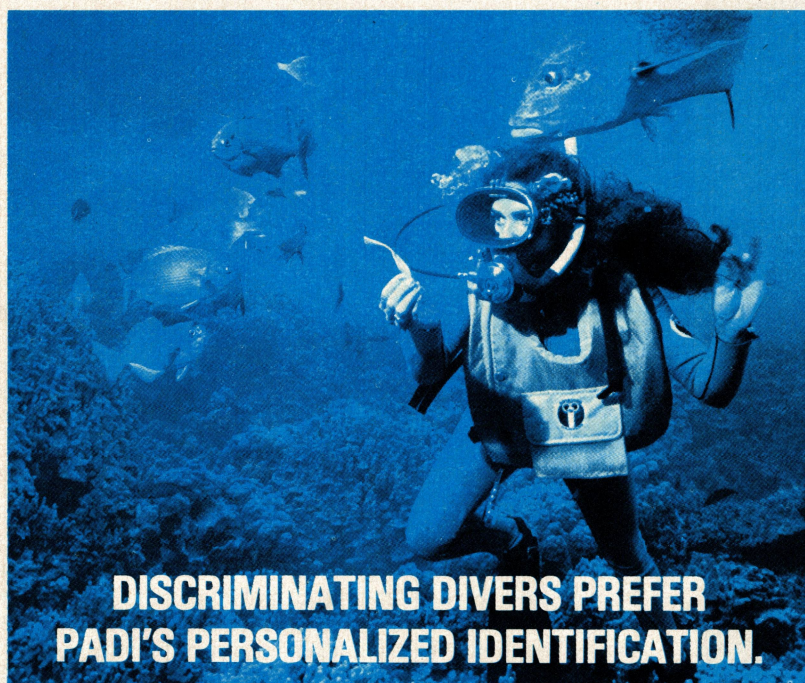
While the absence of sea cucumbers from the marine environment might go unnoticed ecologically, the aesthetic appeal of the environment to divers and naturalists would surely lose substantially. Gross or delicate, sea cucumbers are very much a part of our marine garden of animals. 🐙

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In 1976 Scuba Schools International introduced a new concept in underwater photography instruction.

The instructor course consists of five and one-half days of instruction. There are ten lectures and ten photo dives. At least one 36 exposure roll of film is used on each dive, and the film is processed overnight for evaluation the next day. All aspects of underwater photography are covered, including available light, flash, close-up and macro photography. Special equipment is available for instructor candidates to try, and the candidate will have the opportunity to use more equipment during the week than most people use in a lifetime. Class size is limited to 12 candidates, so each individual receives personal attention and evaluation from the professional instructor.

SSI is holding two Underwater Photography Instructor Schools during 1977 at Key Largo, Florida. The dates are April 18-23 and October 3-8. For information on becoming an SSI Underwater Photography Instructor or for locations where SSI underwater photography instruction is available, write SSI Headquarters, 1634 S. College Ave., Ft. Collins, Colorado 80521.

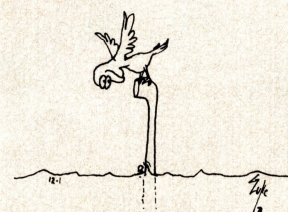
New Vessel for School, Contractor

Robert J. Shourot, president of Undersea Systems, Inc., and director of Coastal Diving Academy, both in Bay Shore, New York, has purchased an ex-Navy LCVP for joint use by both organizations.

The Landing Craft Vehicle (Personnel) is 36 feet long, has an 11 foot beam and is powered by a 671 hp diesel engine. Her forward bow ramp is an excellent dive platform. Her shallow draft, originally designed to permit running up to beaches, lets her navigate even the shallowest waters.

Renamed the *Sea Diver*, this LCVP will be completely outfitted with diving life-support systems and an A-frame type lifting boom. She will be used as a work support vessel, crew boat and push boat as well as a dive boat.

Sea Diver will share her berth at Coastal Diving Academy and Undersea Systems, Inc., with the 68 foot research vessel *Black Coral* and the 104 foot crane vessel *Sea Salvor*.



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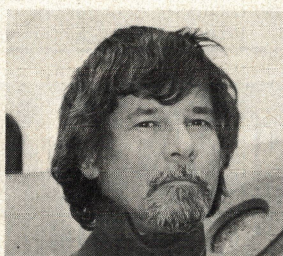
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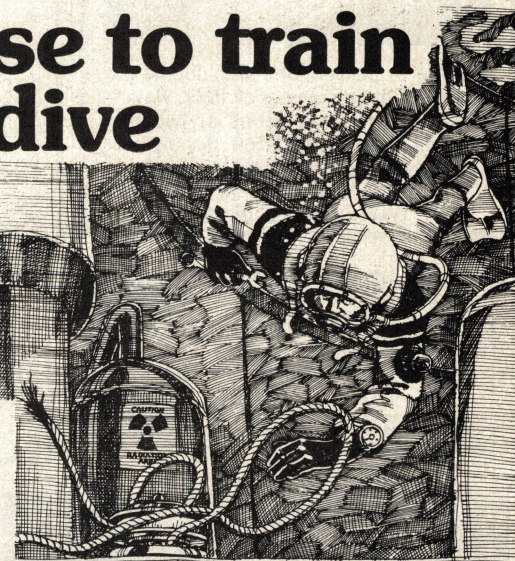
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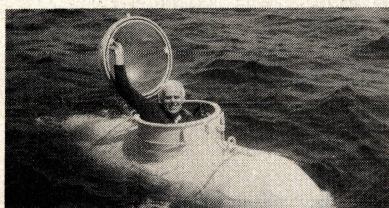
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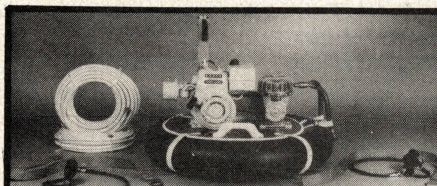
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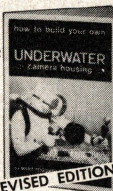
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Our World—U/W VII

Our World—Underwater VII will be held in Chicago on May 6, 7 and 8 at the Sheraton-Chicago Hotel and the Medinah Temple.

A pre-program reception and cocktail party will initiate the festivities on Friday night at 7:30 p.m. in the exhibit area of the Sheraton-Chicago. The following morning, Saturday, May 7, five concurrent seminars will begin at 9 a.m. at the hotel: The Sea and its Occupants, Phantoms of the Fathoms, Dive—The world, The Diver and the Sub-Aquatic Environment, and a to-be-announced potpourri of presentations called Etc., Etc. Each seminar will consist of five presentations—films and slides—from 9 a.m. to noon and from 1 p.m. to 4 p.m.

The curtain will go up at the Medinah Temple for Saturday evening's formal film festival at 8 p.m. Among the films to be presented are: *World Beneath the Sea* by James W. Dutcher; a fascinating 1947 Cousteau documentary on wreck diving and Robin Lehman's *See*. Paul Tzimoulis, Editor/Publisher of SKIN DIVER Magazine will emcee. Two new films by Dr. Joseph MacInnis and Jack McKenney will be premiered.

On Sunday, May 8, at 9 a.m., workshops will begin at the hotel. These mini-how-to-courses are entitled, Photography, Marine Life—Collecting, Cleaning and Cooking, Other Dimensions, which includes bottle collecting, jewelry-making and artifact preservation as well as an in-depth view of wreck diving—how to research and locate wrecks, the types of equipment needed and the legal aspects.

Tickets purchased as a package are \$18 until April 1. After that, the package price is \$20. Individual tickets are: cocktail party \$5; seminars \$7 each; workshops \$4 each and the film festival, \$5.

For further information and tickets contact: Our World—Underwater, P.O. Box 643, Wheaton, Illinois 60187.

INFO '77

A weekend of underwater photography lectures is in store for those attending INFO '77 at the Holiday Inn/O'Hare-Kennedy in Chicago March 19-20th. The seminar is sponsored by the YMCA Mid-America Region Scuba Commissioner.

Lecturers already scheduled represent some of the top underwater photographers and equipment manufacturers in the country. They include: Wes Williams, Oceanic Products; Harry Leach, Subsea, Emerson Mulford, Aqua-Craft.

The INFO series is a format of advanced-level information on one subject. Speakers are given large blocks of time so in-depth discussions on various topics can develop.

For more information contact: Jay Hytner, Scuba Commissioner, 1702 Keo Way, Des Moines, Iowa 50314.

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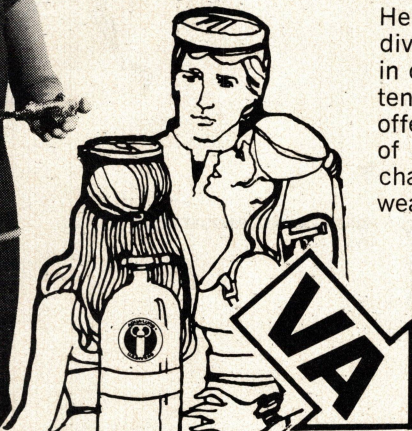
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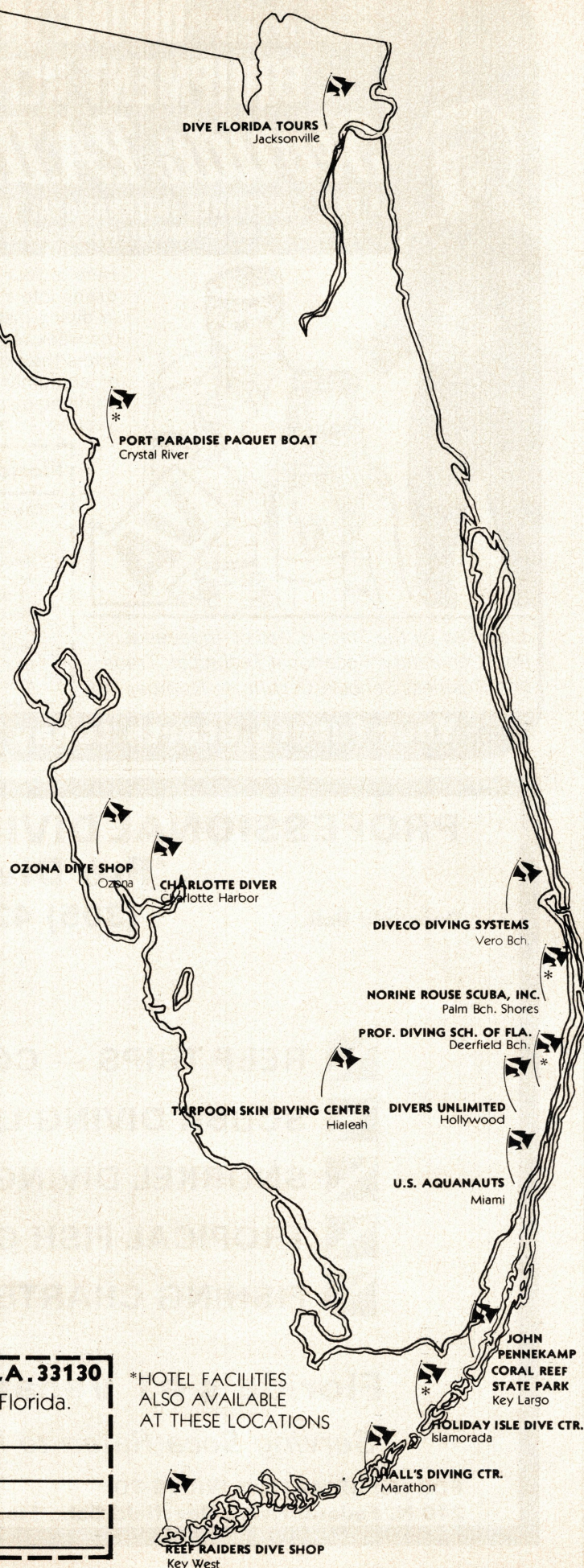
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V.I. Divers Enlarges Facilities

Recent expansion of store space, dive boats, and instructors has enabled V.I. Divers Ltd. to offer some new specialty programs and to expand the daily dive sites schedule to include more than six scuba tours each day and a night dive.



Bret C. Gilliam, President, recently announced that the permanent staff has grown to eight and that a new custom 38 foot dive boat, *Novie*, has been added to the business. Gilliam is widely known for his underwater photography and work on deep diving experiments, and was recently a featured speaker at The International Conference on Underwater Education in San Diego. Both Gilliam and manager Bill Walker are NAUI, PADI and NASDS instructors.

Currently the largest dive boat in the



Virgin Islands, the *Novie* makes daily dive cruises to St. Croix's most popular spots including all the drop-off walls. She has a large enclosed main cabin with a galley, private head and bunks. The deck is completely wall-to-wall carpeted and even has a four-speaker stereo tape system. She is Coast Guard licensed and has all the latest electronic and navigation gear including dual radios and depth finders. She cruises at 11 knots. The *Novie* was recently featured in the television special "Virgin Islands, Virgin Reefs" along with the staff of V.I. Divers Ltd.

Vacation dive packages are available for novices and experienced divers alike, with everything from one week "learn to dive" certification courses to deep drop-off wall exploration regularly scheduled. The store is the largest in the V.I. and stocks over \$20,000 in inventory. Three compressors provide instant air service to 3200 psi. Interested divers may contact direct or book through See & Sea Travel of San Francisco. Write: V.I. Divers Ltd., Pan Am Pavilion, Christiansted, St. Croix, U.S. V. I. 00820.



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St. Thomas...The Happy

A Caribbean Isle That Offers Good Diving
And A Great Social Atmosphere

If you are in search of a new spot for your next dive trip, but are not particularly thrilled with the aspect of spending this year's vacation on a deserted island, you may want to consider St. Thomas. With a resident population of over 45,000 people and a bustling seaport for commercial and luxury liner trade, St. Thomas is one of the busiest island communities in the Caribbean.

Contrary to popular belief, it is possible to find a tropical island paradise which provides the best of both worlds. On the one hand, St. Thomas offers a wide variety of excellent diving, including inexpensive beach diving trips, short offshore excursions, and all-day trips to the more exotic locations. There are more than a hundred different reefs, wrecks, and beaches where a diver can thoroughly enjoy himself.

On the other hand, St. Thomas offers the excitement of a cosmopolitan atmosphere, very much like Honolulu, Hawaii or Hamilton, Bermuda. There are over 40 different restaurants on the island, serving an amazing variety of cuisine from authentic Chinese delicacies to kosher delicatessen. In addition, there are plenty of night clubs, sight-seeing tours and stores for free-port shopping. It's a great place to meet people, make friends and have a good time.

Since St. Thomas is virtually an extension of the U.S. into the Caribbean, everyone speaks English. Hotel service is comparatively good, telephone

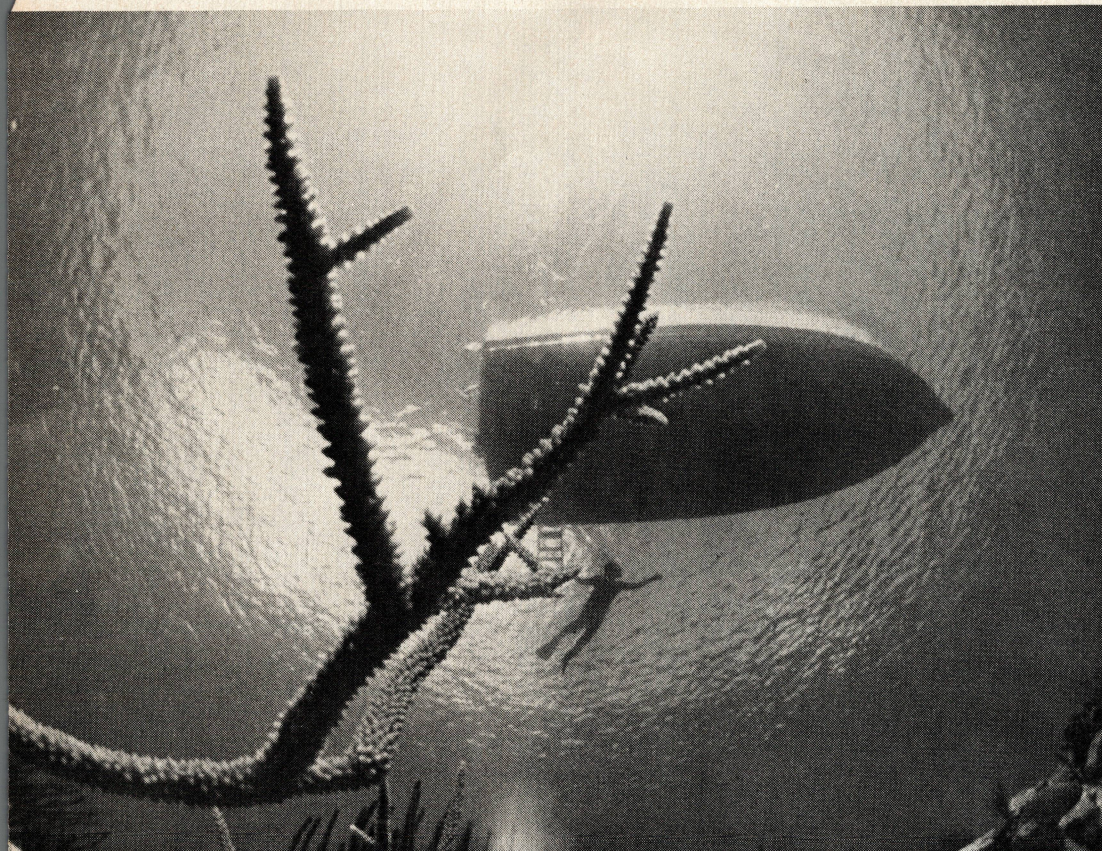


Virgin

By Paul J. Tzimoulis



photography by Author



Little Buck Island, five and a half miles southeast of Charlotte Amalie Harbour is one of the most popular offshore areas for scuba diving. Depths range from 10 to 70 feet and visibility often exceeds 100 feet.

service is reliable, and the mail is reasonably punctual. Electric power and fresh water are also dependable. You have all the creature comforts of the American life style, plus the enchantment and fair weather of a tropical island paradise.

Although the underwater clarity may not compare with Cayman or Roatan, the visibility is good and the diving fun. The waters surrounding St. Thomas are comparatively shallow and dotted with numerous small islands, cays and rocky pinnacles. There are many shallow reefs which are ideal for snorkeling, with depths ranging from five to 20 feet. Most of the good reefs for scuba diving lie in depths ranging from 15 to 50 feet.

St. Thomas is one of three islands which comprise the U.S. Virgins. It is larger than St. John, but only half the size of St. Croix. It measures 13 miles in length and three miles wide. It is a mountainous isle of volcanic origin, with fertile valleys and many protected coves. The highest elevation is 1550 feet.

St. Thomas is only 40 miles from neighboring Puerto Rico. It lies in the southeastern Caribbean, 1500 miles from New York, and 1000 miles from Miami. St. Thomas' climate is mildly tropical. The mean winter temperature is 78 degrees, and the mean summer temperature, 82 degrees. The water temperature is an average 83 degrees.

Most diving is done around the eastern half of island because this is where the population is concentrated — and also the marinas, dive centers and hotels. Dive spots can be divided into four areas: The Harbour, South Side, East End, and North Side.

CHARLOTTE AMALIE HARBOUR is a great spot for artifact diving, old bottle hunting, and wreck diving. It can be dived most any time because it is well-protected from winds. Visibility is not the greatest, but adequate for hunting goodies.

Over 100 ships have been sunk in the Harbour, mostly as a result of the 1867 hurricane which also sank the *Rhone*. Cannons, coins and rare, antique bottles have been recovered by divers searching the harbour area. There are also several small wrecks in shallow water that make excellent wreck diving.

SOUTH SIDE is an area, approximately ten miles long, off the

southern shore of St. Thomas, encompassing many of the offshore islands from Saba to Frenchcap Cay. The most popular of these offshore spots is Buck Island which lies five and a half miles southeast of the harbour. The water here is extremely clear with visibility usually exceeding 100 feet. A protected cove on the west side of the island provides ideal conditions for both shallow-water snorkeling and scuba diving down to 60 feet. The reef is very healthy and loaded with all types of tropical marine life and coral formations. The wreck of a small barge lies in the center of the cove at a depth of 50 feet. Although there is very little left of the wreck, the area is most interesting for a night dive.

On the other side of Buck Island lies the remains of the steamship *Wye*. She was the sister ship of the *Rhone* and sank in the same hurricane of 1867. The wreck is badly broken up but the keel, winches, and other metal parts are still there.

Frenchcap Cay offers perhaps the most spectacular diving to be found in St. Thomas waters. This is a large uninhabited rock pinnacle more than ten miles southeast of Charlotte Amalie Harbour. Visibility here generally runs 150 feet or more because of its distant location from the harbour and the ocean currents which bring a constant flow of clean sea water past this coral outpost. The reef is almost vertical, and loaded with corals, fans and a multitude of marine animals. It is an ideal spot for sighting schooling fish, rays, big barracudas and sometimes sharks.

EAST END covers an area of approximately eight miles around the eastern tip of St. Thomas, both on the north and south coast. This area offers perhaps the greatest number of small islands, cays, pinnacles and reefs which can be explored by sport divers. Cow and Calf Rock is one of the most popular sites for both beginning scuba divers and underwater photographers. The reef encompasses two major rocks which are awash at low tide. Depths range from 20 to 60 feet with good diving available all around the reef.

Fish Cay off St. James Island is an excellent spot for snorkeling and beginning scuba divers. Depths range from 2 to 30 feet and encompass a garden of gorgonians and a variety of shallow coral



heads. A snorkeler can circle the cay in approximately 45 minutes. Other dive sites in the East End area include Cabrita Point, Shark Island, Durlow Cays and Rock Cay.

NORTH SIDE offers two types of diving — beach diving and offshore island exploration. Coki Point Beach is undoubtedly the most popular beach diving site on all of St. Thomas and also a lovely spot for sunbathing, swimming and picnics. Diving depths range from 5 to 60 feet and the bottom terrain is a gradual slope from shore. Although the visibility at Coki is not as good as the offshore reefs, it is a fantastic spot for close-up photography, fish watching and general sport diving. The area is loaded with all types of small invertebrates, including: banded coral shrimp, golden shrimp, arrow crabs, feather duster worms, starfish and more. The area also offers excellent opportunities for photographing all types of marine tropicals, including baby black and white spotted morays and golden tail morays. Coki is also a fantastic spot for night dives because of its accessibility and marine life.

Thatch Cay is a fairly large island approximately one half-mile offshore from Coki Point. This area offers both excellent shallow reef diving for snorkeling and basic scuba and coral cave diving for the more experienced diver. There is a series of five coral caves on the north side of Thatch at an average depth of 30 feet. One of the caves has a lovely vertical chimney leading to the top of the reef.

Further offshore lie a number of other islands which offer some pretty exciting diving opportunities. These include: Congo Cay, Caravel Rock, Tobago Island and Little Hans Lollik. Depths range from 45 to 80 feet with a rather steeply sloping reef. Visibility is excellent and the fish action is often spectacular.

The dive spots briefly described represent less than ten percent of the sites available off St. Thomas. There are virtually hundreds of different reefs, pinnacles, cays and wrecks worthy of undersea exploration. Each dive guide has his own special spots to which he will take visiting divers.

As far as scuba facilities are concerned, St. Thomas has the largest concentration of dive resort operators in the Caribbean,



Coki Beach is a popular site for both snorkeling and scuba diving. Each year thousands of tourists are introduced to these sports while visiting St. Thomas.

second only to Grand Cayman. There are a total of seven different dive operations on St. Thomas alone, with nine more on nearby St. John and St. Croix. They offer the widest range of diving services and facilities imaginable, covering everything from inexpensive beach dives to personalized scuba instruction and guide service.

Most of the dive services on St. Thomas are arranged on an a la carte basis instead of the usual resort hotel package found on other Caribbean islands. Diving is priced on a per trip basis with specific costs for boat trips, equipment rentals and air refills. In other words, you pay only for what is used, and have an opportunity to arrange your diving in a manner which suits your personal needs and time schedule.

Perhaps the most attractive aspect of St. Thomas diving is the convenience in booking a trip. The majority of dive operators schedule at least two dive trips daily, one in the morning and one in the afternoon. Some run three or four trips per day, and one has as many as six trips. Departure times range from early morning (sunrise) to as late as 5 p.m. At least half of the operators offer regularly scheduled night dives. By calling the various operators around the island, a visitor can generally find a dive trip going out almost any given hour of the day or evening. You can dive as little or as much as you can physically handle. The V.I. Dive Operators List included with this article provides specific addresses, names and telephone numbers of the guides on the island.

For its size, St. Thomas has more resort hotel accommodations than most any island in the entire Caribbean. There are over 50 different hotels and guest houses from which to choose. They range from the big luxury style hotels of 100 rooms or more to small guest cottages of one to six units. Among the major luxury hotels are Frenchmen's Reef, a Holiday Inn operation: Caribbean Harbour Club, a giant marina and hotel complex: Bluebeard's Castle, and the Windward. Medium-sized beach-style resorts include: Lime Tree Beach, Carib Beach, Bolongo Bay, Pineapple Beach, Secret Harbour and Sapphire Bay Beach. If you are interested in hotel accommodations located right in the center of Charlotte Amalie, you might try Hotel 1829 or the Galleon House. For a complete listing of hotels and room rates, write to U.S. Virgin Islands, Division of Tourism, 10 Rockefeller Plaza, N.Y., N.Y. 10020.

As for dining, St. Thomas offers one of the finest selections of restaurants to be found on any island. There are at least 40 different places which serve a wide variety of meals and many offer evening entertainment as well. Hotel 1829 is rated the best place on the island for prime rib, and is conveniently located just a short distance from Main Street. Jelly's is an excellent choice for either a lobster or steak dinner. It is located right on the waterfront and offers a very cordial atmosphere. Mafolie provides both a magnificent view of the harbor lights and charcoal broiled steaks of a half dozen different cuts. This unusual restaurant is located on the side of a mountain overlooking Charlotte Amalie and the

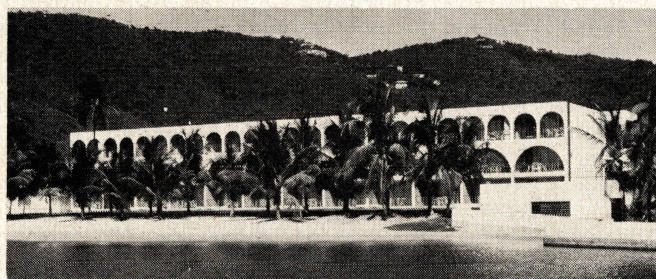
harbor. The Coral Sea offers superb Chinese food prepared by a chef from Hong Kong. It is located in French Town close to the airboat terminal. The Delly is a kosher-style delicatessen located down by the cruise ship terminal and is a favorite for both breakfast and lunch. There is even a MacDonald's for hamburger and milkshake fans.

St. Thomas is one of the busiest ports in the Caribbean, both for trading vessels and cruise ships. Visitors are allowed a duty-free quota of \$200, twice as much as other Caribbean islands.

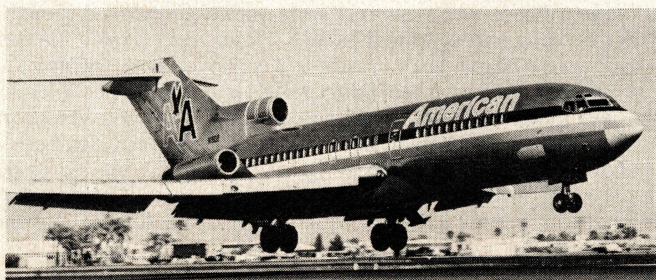
Although the diving at St. Thomas does not have the crystal clarity of Cozumel or San Salvador Island, it does provide a number of advantages for the traveling underwater photographer. Most impressive is the capability of rapid processing. West Indies Photo Labs is unquestionably one of the finest color-processing custom labs in the Caribbean. This lab can process Ektachrome X and High Speed Ektachrome in a couple of days, thus allowing you the advantage of seeing exactly what you've shot while still on the island. You can correct your mistakes on the spot. They can also process black and white films.

In addition to lab processing, St. Thomas has a number of underwater guides who are experienced underwater photographers. Armando Jenik is perhaps the best known because of his photos of marlin, whales, sharks and nudes. At Virgin Islands Diving Schools, Marv Ellis, Danny Murphy and Sue Lefferson are all PADI certified Underwater Photo Instructors.

There is plenty for a non-diver to do. You can spend one day or all week touring St. Thomas and sightseeing. Tours and side trips are available by a variety of different means, including airboat, ship, bus or car. Here are just a few options available: you can take an escorted "walking tour" of downtown Charlotte Amalie. A bus picks you up and takes you to Bluebeard's Castle and then to Crown House where the walk begins. It's great exercise. There's an "island drive" by taxi which circles the island and stops at many of the popular sites such as Mountain Top, Magens Bay and Bluebeard's. There is a two-hour cocktail cruise of Charlotte Amalie Harbour aboard the catamaran Ho Tei. The vessel departs at 5:30 p.m. and returns at 7:30 p.m. in time for a leisurely dinner. You can fly to St. Croix in 20 minutes by airboat, landing right in the harbor at Christiansted. How about an all day "safari" to neighboring St. John? The tour includes a ferryboat ride from the east end of St. Thomas to St. John and a tour of the Annaberg ruins, Virgin Islands National Park, and Caneel Bay Plantation.




One of the most convenient hotels for visiting divers is the Caribbean Harbour Club, a 223 room hotel and marina. American Airlines flies 727 jets from New York to St. Thomas twice daily.



American Airlines operates non-stop 727 jet service from New York to St. Thomas twice daily. The first flight departs at 9:40 a.m. and arrives at 2:13 p.m., thus providing time for a late-afternoon snorkel dive. The second flight departs at 11:40 a.m. and arrives at 4:12 p.m. This is a good flight if you are trying to make connections to New York from some other part of the U.S.

American also has direct jet service from Boston and Providence via the New York gateway. In addition, they operate daily flights to nearby San Juan from Hartford, New York, Newark and Washington, D.C. You can catch a connecting flight from San Juan to St. Thomas on Prinair, North Cay Airlines or Liat.

Eastern offers non-stop jet service from Miami, and connecting jet service from Atlanta. Eastern also operates jets into San Juan. Delta operates jet service from Los Angeles to San Juan via New Orleans, but has no flight direct to St. Thomas.

St. Thomas provides all of the happy ingredients for a well-rounded vacation: good diving, fine hotels, great food, and lots to do after the day's diving activities. It may not have the spectacular drop-offs of Cayman or Honduras, but the diving is fun, interesting, and perfect for the beginning scuba enthusiast. Try it . . . you just might like it! 

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Palmer & Mary Williams, Owners

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Bolongo Bay Beach Club
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St. Thomas, U.S.V.I. 00801
(809) 775-1800
Armando Jenik, Owner

John Hamber's Watersports
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St. Thomas, U.S.V.I. 00801
(809) 775-0755
Gary Deering, Owner

Lagoon Undersea Center
Harm's Marina
Red Hook
St. Thomas, U.S.V.I. 00801
(809) 775-1935
Dave Fredebaugh, Owner

Mask and Fin
Grand Hotel
St. Thomas, U.S.V.I. 00801
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Paul Kennedy & Bruce Isaac, Owners

Undersea Centres
P.O. Box 7100
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(809) 774-3392
Bill Dexter, Operations Mgr.

V.I. Diving Schools
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St. Thomas, U.S.V.I. 00801
(809) 774-8687
Marv Ellis, Owner

Joe Vogel Diving Company
33 Raadets Gade
P.O. Box 7322
St. Thomas, U.S.V.I. 00801
(809) 774-2321
Joe Vogel, Owner

St. Croix

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Christiansted
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Larry Angus, President

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Mike Wallace, Owner

Pressure Limited
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Christiansted
St. Croix, U.S.V.I. 00820
(809) 773-2678
Brian Friedman, Owner

Reflections, Ltd.
Caribbean Reef Club
Pelican Cove
St. Croix, U.S.V.I. 00820
(809) 773-2237
Alex Chuckman, Owner

V.I. Divers, Ltd.
Pan Am Pavillion
Christiansted
St. Croix, U.S.V.I. 00820
(809) 773-6045
Bret Gilliam, Owner

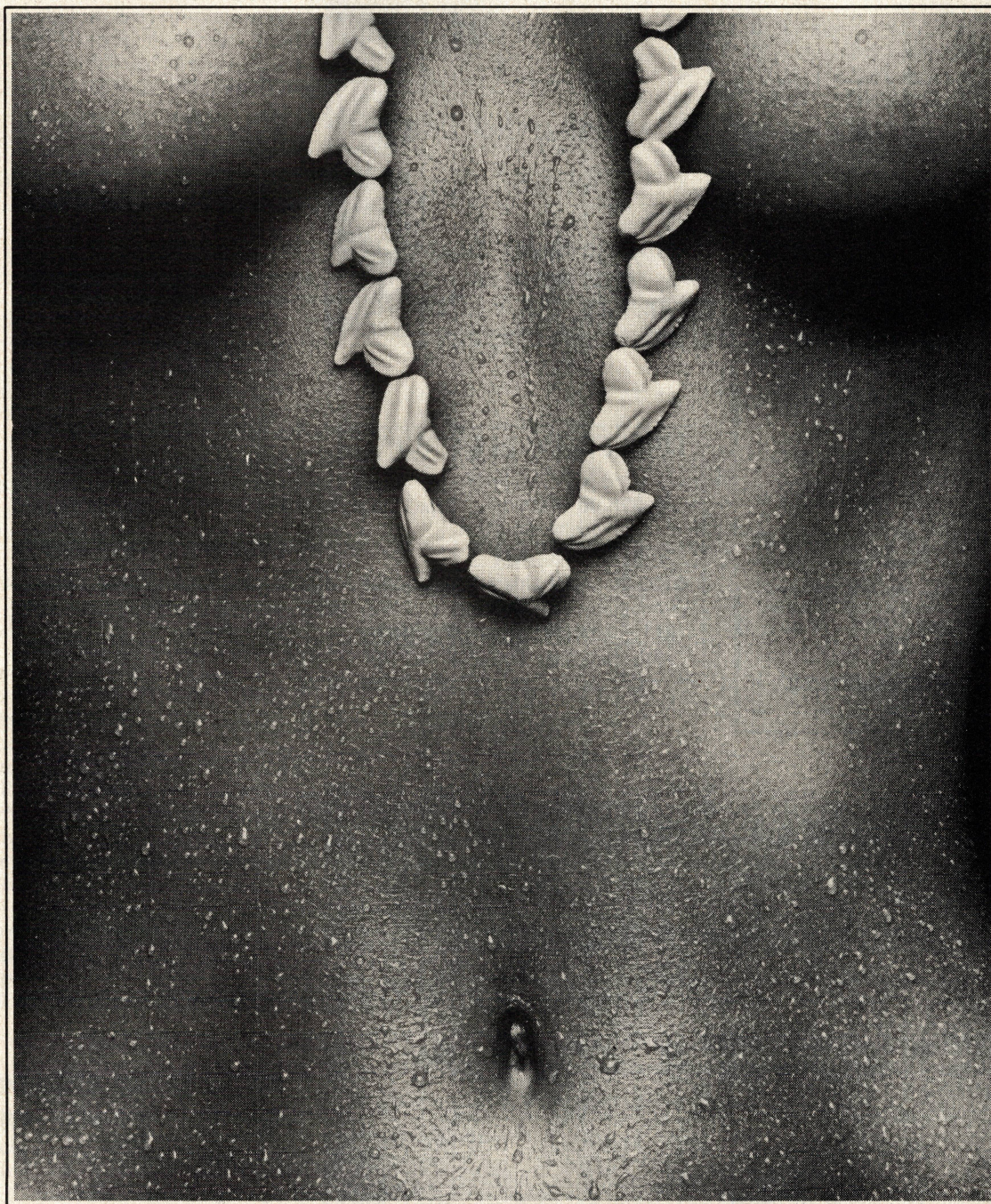
St. John

Caneel Bay Plantation
P.O. Box 120
Caneel Bay
St. John, U.S.V.I. 00830
(809) 776-6111
Charlie Smithline

Cinnamon Bay Water World
P.O. Box 120
St. John, U.S.V.I. 00830
(809) 774-8282

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Bolongo Bay Scuba Center

Over 45 picturesque dive locations are accessible from Armando's Scuba Center at Bolongo Bay, St. Thomas, Virgin Islands. Tours include the famous wreck of the *RMS Rhone*, the deep grain wreck off Sail Rock, and a breathtaking spectacle of reefs and sea gardens from St. Thomas to Virgin Gorda.

Nondivers can learn to dive in the Scuba Center's intensive three-hour course. Tour cost includes equipment, guide and boat. Snorkel instruction and equipment is available at no charge to Bolongo Bay Beach & Tennis Club Members. A single tank dive is \$25, a two tank dive, \$40 and a night dive, \$35.

Armando Jenik is a skilled underwater photographer who has shared the Caribbean's scenic backdrops with Jacques Cousteau, Marlon Perkins and Ron and Valerie Taylor. He is co-author of *Diving Guide to the Virgin Islands*. Like most Caribbean divers, Armando Jenik believes that photography is the only way to shoot underwater. Cameras are available for rent on a daily basis. A Nikonos camera is \$15, including film.

An ideal location for dive groups, Bolongo Bay offers complete hotel facilities combined with the informality of a diving resort. For serious divers who plan to take advantage of the Caribbean's incredible variety, the Scuba Center has several multi-tank plans. Group rates and hotel package rates are available on request. Five single tank dives cost \$100, five double tank dives, \$160.

Arrangements may be made at the Scuba Center for a NAUI certification course. Upon successful completion of the 30 hour course (which includes several open water dives), the diver will receive an unrestricted NAUI diver certification. The course costs \$175.

Armando's Scuba Center maintains a large air station, and full sales, service and rental facilities. A tank may be rented for \$3.50, and an air fill is \$2.

For more information write: Armando's Scuba Center, Bolongo Bay Beach & Tennis Club, P.O. Box 7337, St. Thomas, U.S. Virgin Islands 00801.

New Dive Center On Grand Cayman

Glenn and Mary Jane Galtere are the managers of Flag Royal Palms Diving Service on Grand Cayman. A division of Flag Underwater Services, Ltd., one of the oldest operations on the island, Flag Royal Palms has been housed at the Royal Palms Hotel since July, 1976. At this new location, Glenn and Mary offer personalized service to divers.

New equipment, including 80 cu. ft. aluminum tanks, regulators, vests, masks, fins, snorkels and other items may

be rented. There is also a new compressor, with a 3500 psi capacity, and twelve 300 cu. ft. capacity storage tanks.

Working in association with Teach Tour Diving Company, divers can make reservations by calling the toll-free number, 1-800/523-9361.

Glenn's personal interest is in training programs. He was recently appointed YMCA scuba field representative on Grand Cayman.

During 1977, Glenn and Mary will host a PADI search and recovery course in March, a YMCA instructors institute in April and an underwater photography seminar in June. The photo seminar will be supervised by Ron and Nancy Sefton of Sefton's Undersea Photo Supply, Grand Cayman.

For further information, write to the Galtere's at P.O. Box 490, Grand Cayman, British West Indies.

Instructors Complete U/W Photo Course

Five Caribbean diving instructors recently completed a five day underwater photo instructor course at St. Thomas, Virgin Islands. Arranged and hosted by Marv Ellis, of the Virgin Islands Diving Schools, the course was conducted at the Caribbean Harbor Club with open water photo dives twice daily at Little Buck Island. Lectures were held every morning and evening and film was processed

overnight at the West Indies Photo Labs. Course instructor was SDM Editor-Publisher Paul Tzimoulis.

The course was monitored by Sonna Whisenand for PADI Headquarters, Costa Mesa, California. Graduates were awarded PADI photo instructor certificates. A selection of photos taken during the course was presented on Friday evening to an audience of 100 people at the Caribbean Harbor Club. Winner of the Best Underwater Photo Award was Danny Murphy with a close-up macro shot of a flame scallop. He received a free 16 x 20" color Cibachrome enlargement of the picture, courtesy of the West Indies Photo Labs.

Aquacamp at Grand Cayman

The Aquacamp held at Rum Point Club, Grand Cayman Island, is offering an intensive course in Tropical Marine Biology during the third session, August 4, 1977. Granting three semester-hours of credit (graduate or undergraduate) from Texas Christian University, the course will be taught by Dr. Joseph Britton, Associate Professor of Biology, Texas Christian University.

Dr. Britton has had extensive field work in tropical biology. In the spring of '77, he will take his third group of TCU students to Roatan, Spanish Honduras, for the same course he will teach on

Grand Cayman. As a result of his work on that island, he has published a book, *Roatan, The Western Caribbean Island*.

To date, he has been associated with five research projects on Swan Island, in the Caribbean, and in March of '77, he will accompany the Woods Hole, Massachusetts, training vessel, the *Westwind*, as a member of their Sea Education Association project to study the Swan Island bank and shelf.

The cost of the course, listed in the Texas Christian catalog as Biology 5903, Tropical Biology, is \$70 per credit hour, plus the \$25 registration fee. This cost is in addition to the regular camp fees, which are \$500 for the period August 1-14. These fees include double or triple occupancy room, private bath, three meals per day, use of scuba gear, tanks, guide service, and pick-up and return to the airport. Those enrolling in the course who are nondivers will be given scuba instruction at the beginning of the course, and the cost of that instruction is included in the cost of the course.

Although those enrolling in the course will have little time to participate in other camp activities, accompanying nonstudents will have the opportunity to enjoy all of the camp activities at the all-inclusive fee of \$500. Nonstudents should request details from: Aquacamp, Mrs. Thelma Clark, Director, 200 Ansel Road, Geneva, Ohio 44041.



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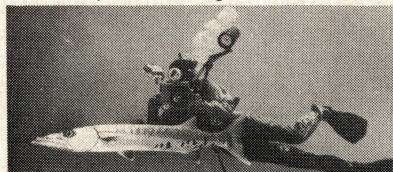
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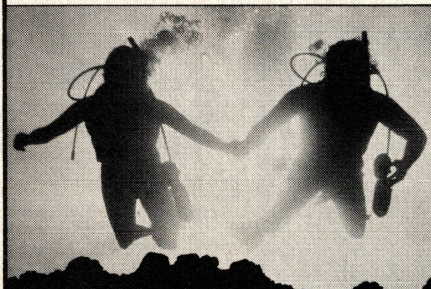
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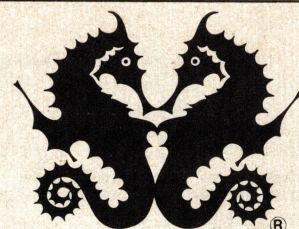
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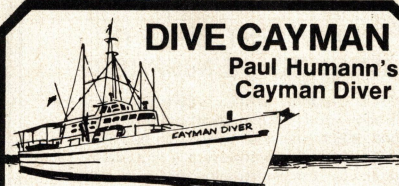
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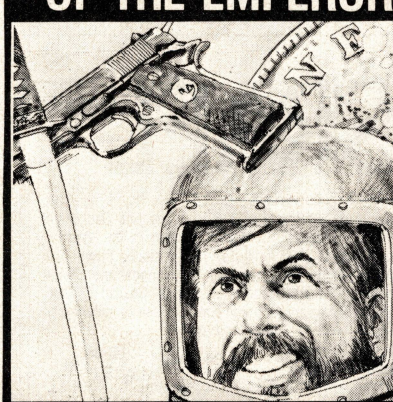
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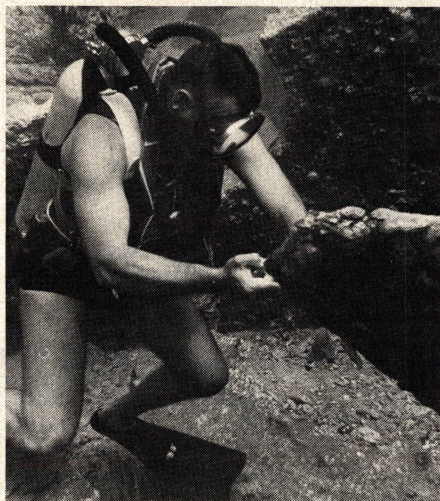
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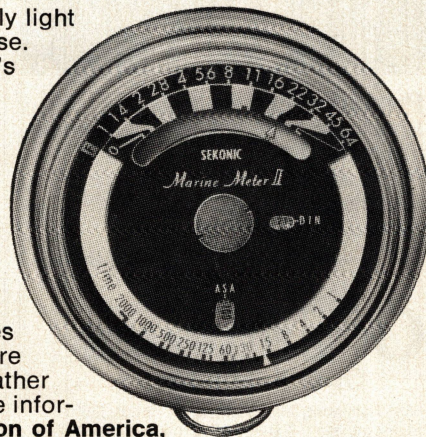
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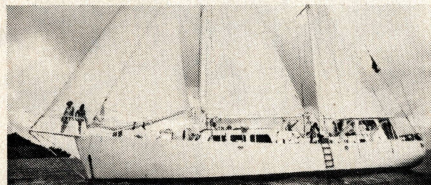
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See & Sea to Tahiti

See & Sea Travel Service has announced two 1977 departures for its Tahiti outer islands dive cruise.

The first departs April 30, escorted by Peter Capen, while the second departs June 4, escorted by Rich Bergero.

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aboard the *Danae III*. This sailing dive cruiser visits exquisite reefs and islands all through Tahitian waters.

The remainder of the program is spent on Rangiroa Atoll in the Tuamotu islands, site of the filming of the underwater classic, *The Predators*. Here divers shoot the swift waters of the pass, plus find large manta rays and other pelagic species on the lush outer reefs.

For further information on this dive adventure contact See & Sea Travel Service, 680 Beach Street, San Francisco, Calif. 94109.

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Caneel Bay Plantation, located on the island of St. John, is the "Shangri-la" of the U.S. Virgin Islands. Almost two-thirds of this tropical island and adjacent waters are protected by the National Park Service to preserve its natural beauty.

Caneel Bay is the home of Scuba Ventures, Ltd. and professional dive instructors Charlie and Dot Smithline. Their *Bonita*, a Coast Guard licensed dive boat, goes to more than 25 dive locations which are within 15 minutes of Caneel Bay. The boat has a large dive platform and ladder to make getting in and out of the water easy, as well as a canvas top for protection from the sun. Two 5000 psi air compressors deliver 30 cfm which fill tanks in three minutes.

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Dive tour rates are \$20 per half-day dive (one tank), \$35 per half-day (two tanks), \$25 per night dive (one tank) and \$45 per full-day (two tanks) to the wreck of the *Rhone*.

For reservations and information call the activities director at Caneel Bay Plantation, 809/776-6111, extension 39.

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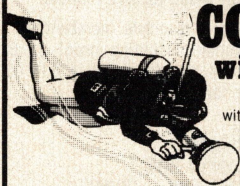
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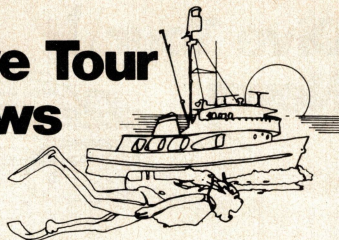
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Dive Tour News



Mar. 4-6, 11-13, 18-20, 25-27—FLORIDA—3 days, Dive Florida Tours, Jacksonville, FL

Mar. 4, 11, 18, 25—BONAIRE—8 days, Lisind Int'l, New York, NY

Mar. 4, 11, 18, 25—BONAIRE—8 days, World Wide Divers, Inc., New York, NY

Mar. 5, 12, 19, 26—GRAND CAYMAN—8 days, Lisind Int'l, New York, NY

Mar. 5—ST. THOMAS—8 days, Go Diving, Inc., Minneapolis, MN

Mar. 5—HAWAII—8 days, Go Diving, Inc., Minneapolis, MN

Mar. 5, 12, 19, 26—M/S SOUTHWARD—U/W Adv. Assoc. 800-621-0472

Mar. 5, 19—BELIZE—7 days, White Water River Expeditions, Turlock, CA

Mar. 5, 12, 19, 26—MAYA BEACH BELIZE—8 days, Horizons Int'l, Seattle, WA

Mar. 6, 18—FLORIDA KEYS—5 days, Capt. Tom Guarino, Dive Boat Annie-Up, Key Largo, FL

Mar. 9—GALAPAGOS ISLANDS—18 days, Jack McKenney, See & Sea, San Francisco, CA

Mar. 12—COZUMEL—8 days, Go Diving, Inc., Minneapolis, MN

Mar. 12—ROATAN—8 days, Go Diving, Inc., Minneapolis, MN

Mar. 12—BIMINI—5 days, Adventure Cruises, Ft. Lauderdale, FL

Mar. 12—CAYMAN ISLANDS—8 days, See & Sea Travel, Inc., San Francisco, CA

Mar. 13—SAN SALVADOR—8 days, Columbus Landing, Ft. Lauderdale, FL

Mar. 13—PHILIPPINE ISLANDS—16 days, Carl Roessler, See & Sea Travel, San Francisco, CA

Mar. 19—ROATAN—8 days, Go Diving, Inc., Minneapolis, MN

Mar. 19—BELIZE—7 days, Go Diving, Inc., Minneapolis, MN

Mar. 19—SNOWBIRD & BAJA CALIF—14 days, World Wide Divers, Inc., New York, NY

Mar. 19—COZUMEL—8 days, See & Sea Travel, Inc., San Francisco, CA

Mar. 21—BIMINI—7 days, Adventure Cruises, Ft. Lauderdale, FL

Mar. 26—COZUMEL—8 days, Go Diving, Inc., Minneapolis, MN

Mar. 26—COZUMEL—8 days, Ronald Kipp, Tri-City Travel, Kingsport, TN

Mar. 26—FLOWER GARDENS—2 days, Diver's World, Richardson, TX

Mar. 26—COZUMEL—8 days, Ronald L. Kipp, Tri-City Travel, Kingsport, TN

Apr. 1-3, 8-10, 15-17, 22-24, 29-5/1—FLA.—3 days, Dive Florida Tours, Jacksonville, FL

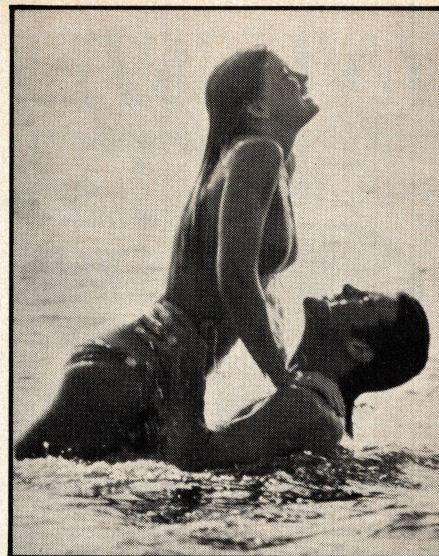
Apr. 1, 8, 15, 22, 29—BONAIRE—8 days, World Wide Divers, Inc., New York, NY

Apr. 2, 9, 16, 23, 30—GRAND CAYMAN—8 days, Lisind Int'l, New York, NY

Apr. 2, 9, 23—SAN SALVADOR—8 days, Columbus Landing, Ft. Lauderdale, FL

Apr. 2—ROATAN—8 days, Go Diving, Inc., Minneapolis, MN

Apr. 2—COZUMEL—8 days, Go Diving, Inc., Minneapolis, MN



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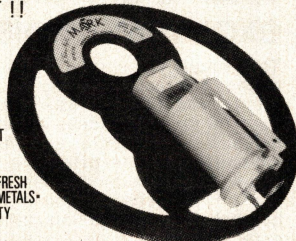
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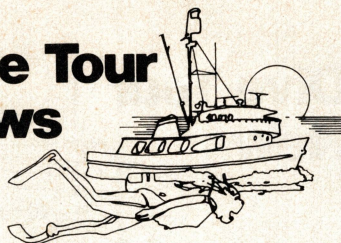
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Dive Tour News



- Apr. 2, 9, 16, 23, 30—M/S SOUTHWARD—U/W Adv. Assoc. 800-621-0472
- Apr. 2—BELIZE—7 days, White Water River Expeditions, Turlock, CA
- Apr. 2, 9, 16, 23, 30—MAYA BEACH BELIZE—8 days, Horizons Int'l, Seattle, WA
- Apr. 2—CAYMAN ISLANDS—8 days, See & Sea Travel, Inc., San Francisco, CA
- Apr. 9—ROATAN—8 days, Go Diving, Inc., Minneapolis, MN
- Apr. 9—BIMINI—5 days, Adventure Cruises, Ft. Lauderdale, FL
- Apr. 9—COZUMEL—8 days, See & Sea Travel, Inc., San Francisco, CA
- Apr. 16—BELIZE—8 days, Go Diving, Inc., Minneapolis, MN
- Apr. 16—HAWAII—7 days, Go Diving, Inc., Minneapolis, MN
- Apr. 16—BIMINI—7 days, Adventure Cruises, Ft. Lauderdale, FL
- Apr. 16—BONAIRE—8 days, See & Sea Travel, Inc., San Francisco, CA
- Apr. 19—BIMINI—5 days, Capt. Tom Guarino, Dive Boat Annie-Up, Key Largo, FL
- Apr. 23—COZUMEL—8 days, Go Diving, Inc., Minneapolis, MN
- Apr. 23—GRAND CAYMAN—8 days, Jack's Dive Center Inc., Plainville, CT
- Apr. 23—SAN SALVADOR, BAHAMAS—8 days, Tri-City Divers, Vernon, CT
- Apr. 25—BIMINI—7 days, Go Diving, Inc., Minneapolis, MN
- Apr. 30—FREEPORT—8 days, Go Diving, Inc., Minneapolis, MN
- Apr. 30—REMOTE ISLAND, TAHITI—15 days, Peter Capen, See & Sea, San Francisco, CA
- May 3—BIMINI—5 days, Capt. Tom Guarino, Dive Boat Annie-Up, Key Largo, FL
- May 4—GALAPAGOS ISLANDS—18 days, Bob Hollis, See & Sea Travel, Inc., San Francisco, CA
- May 6-8, 13-15, 20-22, 27-29—FLORIDA—3 days, Dive Florida Tours, Jacksonville, FL
- May 6, 13, 20, 27—BONAIRE—8 days, Lisind Int'l, New York, NY
- May 6, 13, 20, 27—BONAIRE—8 days, World Wide Divers, Inc., New York, NY
- May 7, 14, 21, 28—GRAND CAYMAN—8 days, Lisind Int'l, New York, NY
- May 7—ST. THOMAS—8 days, Go Diving, Inc., Minneapolis, MN
- May 7—ROATAN—8 days, Go Diving, Inc., Minneapolis, MN
- May 7—SAN SALVADOR—8 days, Columbus Landing, Ft. Lauderdale, FL
- May 7, 14, 21, 28—M/S SOUTHWARD—U/W Adv. Assoc. 800-621-0472
- May 7, 18—BIMINI—7 days, Adventure Cruises, Ft. Lauderdale, FL
- May 11, 17, 23—BIMINI—5 days, Capt. Tom Guarino, Dive Boat Annie-Up, Key Largo, FL
- May 14—COZUMEL—8 days, Go Diving, Inc., Minneapolis, MN
- May 14—BELIZE—7 days, Go Diving, Inc., Minneapolis, MN
- May 14, 28—ANGUILLA/ST. BARTS—12 days, Trimaran Misty Law, St. Thomas, VI

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May 14—CAYMAN ISLANDS—8 days, See & Sea Travel, Inc., San Francisco, CA
 May 14—RED SEA, AQABA—15 days, Carl Roesler, See & Sea Travel, Inc., San Francisco, CA
 May 21—HAWAII—8 days, Go Diving, Inc., Minneapolis, MN
 May 21—ROATAN—8 days, Go Diving, Inc., Minneapolis, MN
 May 21—COZUMEL—8 days, See & Sea Travel, Inc., San Francisco, CA
 May 21—BONAIRE—8 days, See & Sea Travel, Inc., San Francisco, CA
 May 28—COZUMEL—8 days, Go Diving, Inc., Minneapolis, MN
 May 28—BERMUDA—4 days, World Wide Divers, Inc., New York, NY
 June 3-5, 10-12, 17-19, 24-26—FLORIDA—3 days, Dive Florida Tours, Jacksonville, FL
 June 3, 10, 17, 24—BONAIRE—8 days, World Wide Divers, Inc., New York, NY
 June 3, 10, 17, 24—BONAIRE—8 days, Lisind Int'l, New York, NY
 June 4, 11, 18, 25—GRAND CAYMAN—8 days, Lisind Int'l, New York, NY
 June 4—ROATAN—8 days, Go Diving, Inc., Minneapolis, MN
 June 4, 11, 18, 25—M/S SOUTHWARD—U/W Adv. Assoc. 800-621-0472
 June 4—REMOTE ISLANDS, TAHITI—15 days, See & Sea Travel, Inc., San Francisco, CA
 June 4—TRUK, MICRONESIA—13 days, See & Sea Travel, Inc., San Francisco, CA
 June 6, 21—BIMINI—10 days, Adventure Cruises, Ft. Lauderdale, FL
 June 11—COZUMEL—8 days, Go Diving, Inc., Minneapolis, MN
 June 11—FREEPORT—8 days, Go Diving, Inc., Minneapolis, MN
 June 11—CAYMAN ISLANDS—8 days, See & Sea Travel, Inc., San Francisco, CA
 June 18—ROATAN—8 days, Go Diving, Inc., Minneapolis, MN
 June 18—HAWAII—7 days, Go Diving, Inc., Minneapolis, MN
 June 18—VIRGIN ISLANDS—12 days, Trimaran Misty Law, St. Thomas, VI
 June 18—COZUMEL—8 days, See & Sea Travel, Inc., San Francisco, CA
 June 25—COZUMEL—8 days, Go Diving, Inc., Minneapolis, MN
 June 25—BELIZE—7 days, Go Diving, Inc., Minneapolis, MN
 July 1-4, 8-10, 15-17, 22-24, 29-31—FLORIDA—3 days, Dive Florida Tours, Jacksonville, FL
 July 1, 8, 15, 22, 29—BONAIRE—8 days, Lisind Int'l, New York, NY
 July 1, 8, 15, 22, 29—BONAIRE—8 days, World Wide Divers, Inc., New York, NY
 July 2, 9, 16, 23, 30—GRAND CAYMAN—8 days, Lisind Int'l, New York, NY
 July 2—ROATAN—8 days, Go Diving, Inc., Minneapolis, MN
 July 2, 9, 16, 23, 30—M/S SOUTHWARD—U/W Adv. Assoc. 800-621-0472
 July 2—VIRGIN ISLANDS—12 days, Trimaran Misty Law, St. Thomas, VI
 July 2—SAN SALVADOR, BAHAMAS—8 days, Tri-City Divers, Vernon, CT
 July 2—TRUK, MICRONESIA—13 days, See & Sea Travel, Inc., San Francisco, CA
 July 2—CAYMAN ISLANDS—8 days, See & Sea Travel, Inc., San Francisco, CA
 July 6—GALAPAGOS ISLANDS—18 days, Paul Humann, See & Sea, San Francisco, CA
 July 9—ANDROS, BAHAMAS—7 days, Fred Calhoun's Underwater Safaris, Boston, MA
 July 9—COZUMEL—8 days, Go Diving, Inc., Minneapolis, MN
 July 9—BONAIRE—8 days, See & Sea Travel, Inc., San Francisco, CA

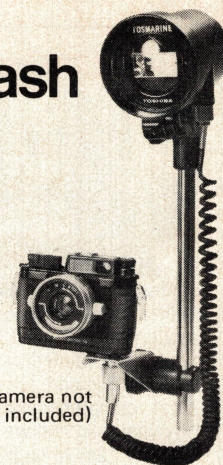
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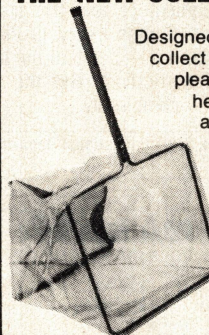
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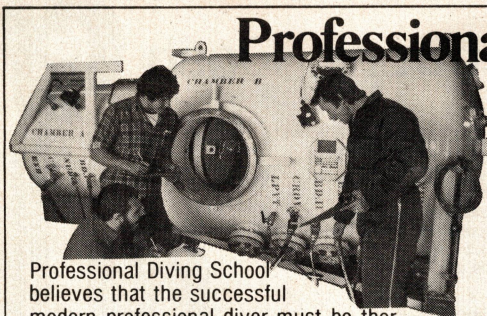
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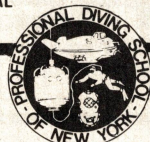
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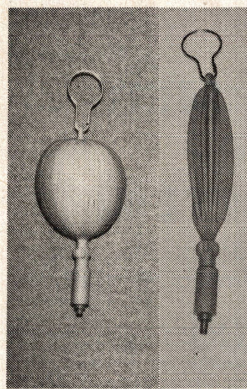
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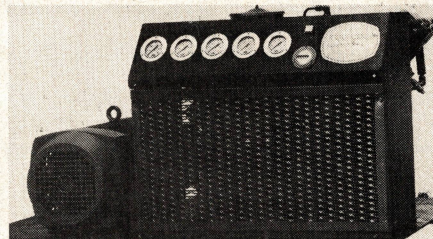
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Worthington Appoints Innerspace

Innerspace Research of Hialeah, Florida, has been appointed the only original equipment manufacturer for Worthington high pressure compressors.



A new compressor, designed by Innerspace for exclusive world-wide distribution, has been especially adapted to the life-support field by Innerspace Research. The compressor pumps in excess of 20 cfm at 5000 psi.

In addition to the Worthington line of 12-20 cfm compressors, Innerspace also distributes the Austrian line of Poseidon compressors. Poseidon currently makes 2 models — a 3 cfm unit and a 7 cfm unit — both operational to 500 psi.

Compressors from Innerspace have an in-house capability of 3 cfm to 100 cfm and are in stock for immediate delivery. In addition to the compressors they sell, Innerspace also fully maintains their products and builds a complete line of filter systems.

For information on Innerspace Research, contact the company at 4780 East 11th Ave., Hialeah, Fla. 33013.

Sea Rovers '77

The Boston Sea Rovers will hold their 23rd annual underwater clinic, Sea Rovers '77, on March 5 in Boston. It will be followed on March 6-7 by the National YMCA Scuba Convention. Those attending the YMCA convention are invited to Sea Rovers '77 as well.

The Sea Rovers program will be held at the John Sherman Union and Law Auditorium of Boston University, on Commonwealth Avenue, from 10 a.m. to 4 p.m. More than twenty speakers will cover topics which will include: tours, underwater photography, marine biology, safety, teaching scuba, equipment, cave diving, physiology and more. There will also be marine careers counseling.

More than 20 exhibitors will have displays in the Sonnabend Lounge of the Sherman Union.

The evening program will be held at the John Hancock Hall, on Berkley Street, at 8 p.m. There will be films and slides by Rick Frehsee, David Doubilet, Robin Lehman and Paul Tzimoulis.

NOGI awards will be presented to Dr. Melville Bell Grosvenor of the National Geographic Society and Dr. Robert Ballard.

The Sea Rovers "Laugh-In" reception will be held after the evening program in the Dorothy Quincy Suite of John Han-

cock Hall with an open bar.

Tickets are available from Robert Newberry, 87 Bellingham St., Chelsea, Mass. 02150. Combined day/evening tickets are \$7, reception tickets are \$6. For more information call Bunky Hodge, 617/878-8710.

The National YMCA Scuba Convention will be held at the Copley Plaza Hotel in Boston. Programs are designed for both instructors and sport divers. Tickets are \$25 and can be obtained from Richard Smith, Lindell Avenue, Leominster, Mass. 01453. >#

Diving M.D.'s Workshop

The Second Practical Training Course in Hyperbaric Medicine, sponsored by Dive-Med International, is scheduled for April 18-24 on the island of Grand Cayman. The course is approved by the American Medical Association, through the Undersea Medical Society, for 20 continuing medical education Category I credits. This advanced practical workshop is designed for physicians who have completed a basic diving physician's course, accredited by the American Medical Association, or with equivalent hyperbaric experience.

The course includes training in medical skills using simulator training aids to allow the physicians to experience and practice intubation, CPR, intravenous therapy, chest needling to relieve

pneumothorax, and catheterization at pressure from 60-165 fsw. In addition, all physicians operate the chamber, practicing lock-in/lock-out of supplies and patient transportation. Seminars covering fire and environmental control, the medical problems of offshore saturation diving and practical exercises in the diagnosis and treatment of decompression sickness, are essentials of the course.

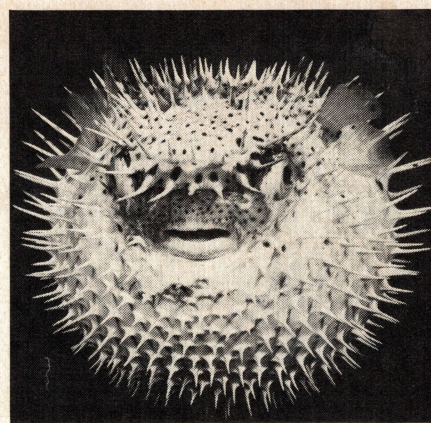
The faculty includes Edward S. Tucker, M.D., director of medical education; Watson Kime, M.D., medical director; Dr. Robin Cox, medical director, Phillips Petroleum Company Europe-Africa, and Edward L. Sherrer, Jr., M.D., medical director, Oilfield Medical Services.

For further information contact Dive-Med International, 1101 North Calvert St., Baltimore, Md. 21202. >#

New Dutcher Film

A movie about aggression, attack and defense under the sea has been made by James W. Dutcher of La Jolla, California. Entitled *World Beneath the Sea*, it stars his wife, Renate Dutcher, and such other ocean creatures as the porcupinefish, stingray, octopus, moray eel, jellyfish and sea urchin.

Filmed entirely on location in the West Indies, *World Beneath the Sea* shows how creatures live and survive among the reefs. A reviewer for Film News Magazine in New York was quoted as being "stunned" by the "gorgeous color



photography and excellent music."

Dutcher's other films, many of which have won awards, include: *Color of a Dream*, *Sea Sorcery*, *Drop By Drop to the Sea*, *Secrets of the Sea* and *An Angelfish*.

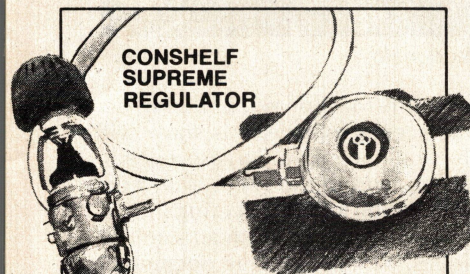
He is also a talented still photographer and his work has been published in SKIN DIVER, National Geographic, Oceans Magazine, Readers' Digest Books, CRM Books, National Wildlife and The Undersea World of Jacques Cousteau.

Paramount-Oxford Films has purchased the educational and noncommercial television rights for distribution as a nonacademic property.

The 16mm movie is 23 minutes long. It may be bought for \$365 or rented for \$35. For further information write: Paramount-Oxford Films, 5451 Marathon Street, Hollywood, Calif. >#

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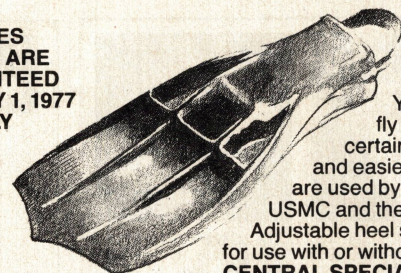
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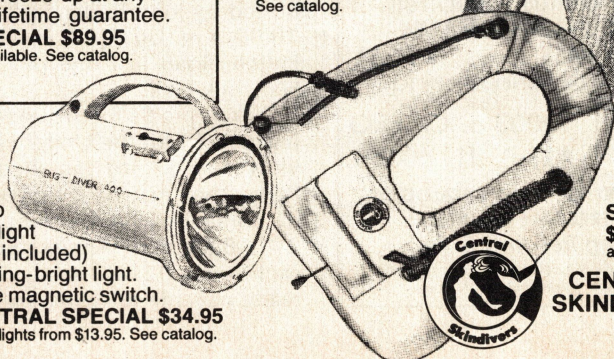
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NAUI U/W '77

Divers in New England will assemble for the NAUI Underwater '77 show on April 16. The Science Center of Harvard University will house the underwater symposium from 10 a.m. to 5 p.m. Many exclusive presentations will be made by the dive world's leading figures including: frozen waterfall diving by Lewis Lainey and Ben Harris, German U-boat diving (one we sank) by Bill Palmer, diving the Main coast by Wes Hedlund and Joe Gallant, diving in an atomic reactor by Tink Manry, physiology of Man-In-The-Sea by doctors Don Butterfield and Larry Jacobs.

Additionally, underwater symposium attendees will hear the latest on the Loch Ness monster, hunting New England shipwrecks, marine biology of the North Atlantic coast, a new and different diver's float, with representatives from Parkway-Poseidon, the Ocean Corp., Klein Associates, Woods Hole Oceanographic Institute, NAUI, Massa Corp., Benthos, the Connecticut Council of Diving Clubs, The New England Aquarium, the Maine Sub-Aqua Club, New England Divers, and more. There will be 40 presentations in all.

At 7:30 p.m. Fred Calhoun will present the Underwater Film Review featuring an exclusive engagement of the *Cousteau Story*, at John Hancock Hall, Berkeley Street, Boston, Massachusetts. Tink Manry, guest emcee will introduce the



Bill Macdonald

film with Bill Macdonald. Utilizing behind the scenes footage, this show will take the audience on a *Calypso* expedition. Excerpts from the *Silent World* are included as well as film covering the development of many of Cousteau's unique techniques. Vintage footage documents Cousteau divers on ancient wrecks, into caves, and at the beginnings of man's living in the sea.

The NAUI Decompression Party, hosted by John Butler, will be staged at 10:00 p.m. on April 16, at the Statler Hilton Hotel just one block from John Hancock Hall.

Tickets are \$4 for the underwater symposium, \$4 for the Underwater Film Review and \$7 for the Decompression Party. They may be acquired in advance by contacting Fred Calhoun, P.O. Box 291, Back Bay Annex, Boston, Massachusetts 02117. Checks should be made payable to NAUI.

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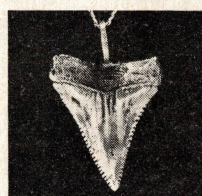


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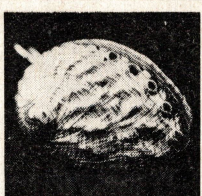
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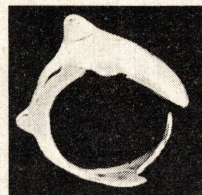
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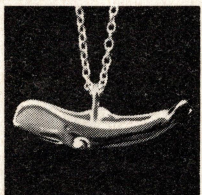
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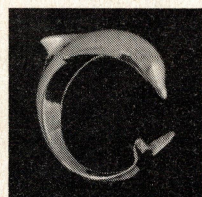
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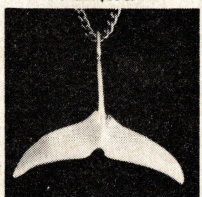


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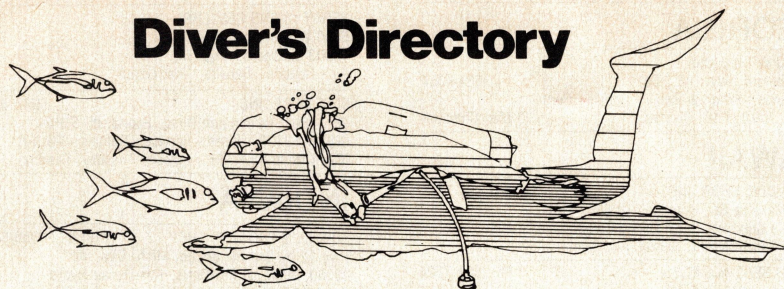
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SEA DWELLERS DIVE CENTER 305/451-3640
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PROFESSIONAL DIVING SCHOOLS OF FLORIDA
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Sales Representative - Rentals - Air - Instruction - PADI College

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DIVERS WORLD 923 Gist Ave., Silver Spring, Md. SALES-AIR-RENTALS & B.S. Wreck Diving Trips Every Weekend	589-7564
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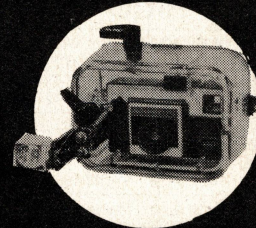
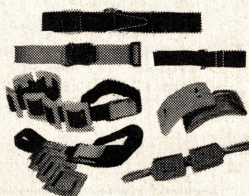
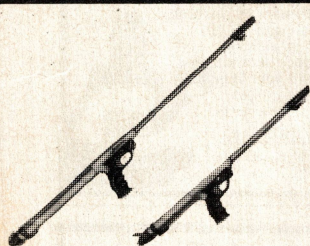
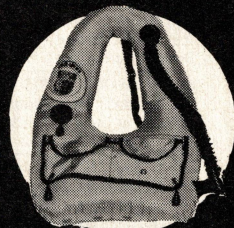
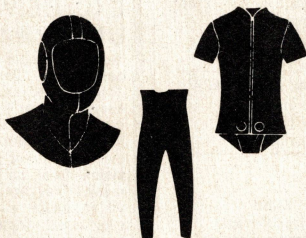
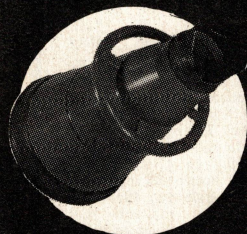
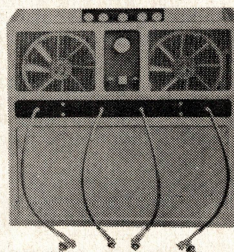
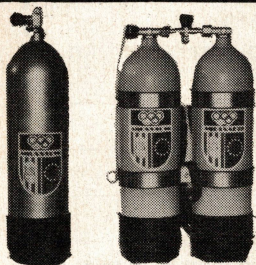
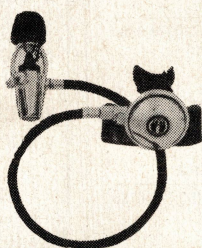
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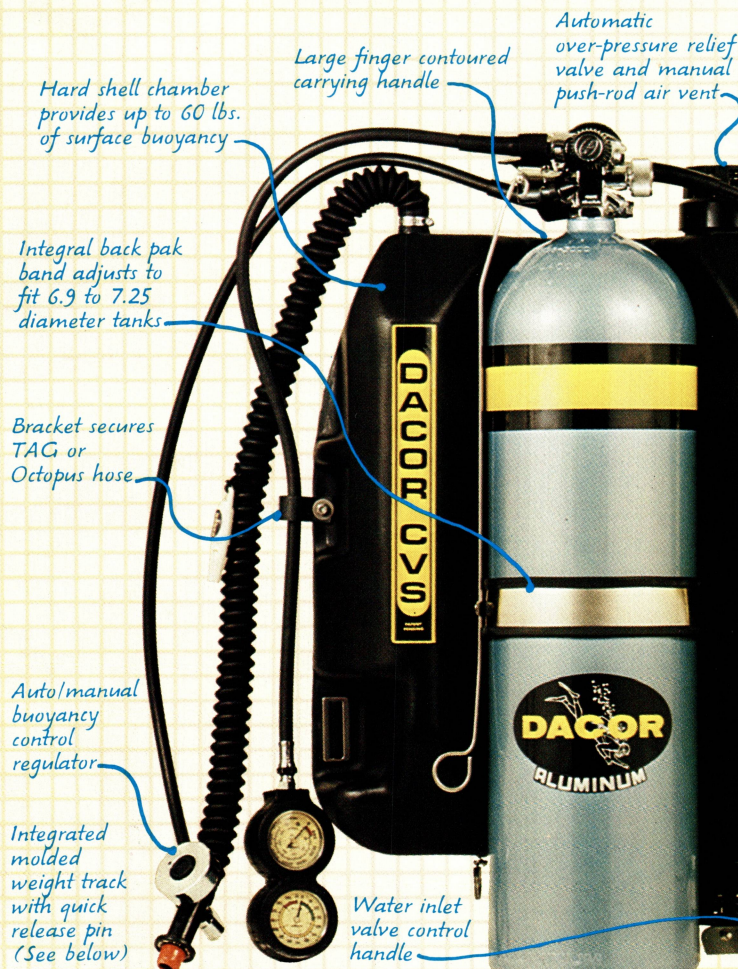
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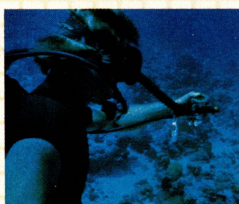
New Dacor NAUTILUS

Constant Volume System

(Patents Pending)

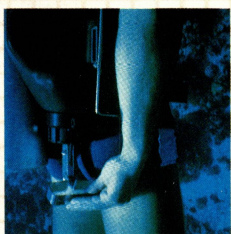


THE MOST REVOLUTIONARY BUOYANCY CONTROL SYSTEM SINCE THE DEVELOPMENT OF THE SUBMARINE

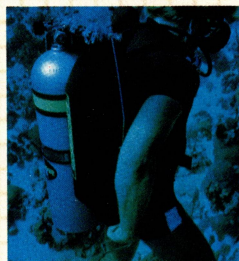


BUOYANCY CONTROL REGULATOR

The auto/manual regulator equalizes the internal chamber pressure with outside water pressure, protecting the unit from stress and allowing the diver to use the CVS at desired depth.

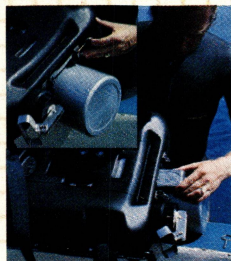


WATER INLET VALVE—Valve is used to obtain desired buoyancy by allowing water to enter or exit chamber. The fixed ratio of water to air contained within the chamber determines the buoyancy.



OVERPRESSURE RELIEF VALVE

This valve functions automatically and can be manually controlled by the push rod to create another air vent that increases speed of water fill.



INTEGRATED WEIGHT TRACK—Up to four special Nautilus 4 lb. weights fit in molded channel giving diver up to 16 lbs. of ballast. Weight release pin in lower left side of unit. Easy to reach in emergency.

The Nautilus Constant Volume System was developed by Dacor as the ultimate answer to divers' demands for a completely integrated buoyancy control system. After years of research and development of B.C. systems, including the introduction of the finest line of vests on the market, Dacor engineers have developed the ideal B.C. approach with the Nautilus—TOTAL BUOYANCY CONTROL by utilizing a hard shell unit like the ballast tanks of a submarine with three automatic controls (all have manual override). The CVS is an improvement on soft-walled systems because it eliminates the manual adjustment necessary at each depth change. The Nautilus was *diver/engineered* for maximum comfort, efficiency and the convenience of one integrated unit (utilizing weight, B.C., power inflator, back pak, tank*, regulator*, tank pressure gauge*). We waited until we had the best B.C. system available . . . and here it is! (*Not included with CVS)

Model CVS—Nautilus System—

Complete unit including ballast chamber, wgt. channel, pak, harness, valves, hoses, and regulator.

Model CVSDW—Nautilus Lead Weights

—Specially designed 4 lb. lead weights. Channel holds up to four 4 lb. weights.

Model CVSWF—Neutral Buoyancy

Filler Blocks—Inserted in wgt. channel whenever less than four wgt. are used.

Model CVSCB—Nautilus Carrying Bag—Heavy duty Hercules® zippered construction to carry and protect your CVS.



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